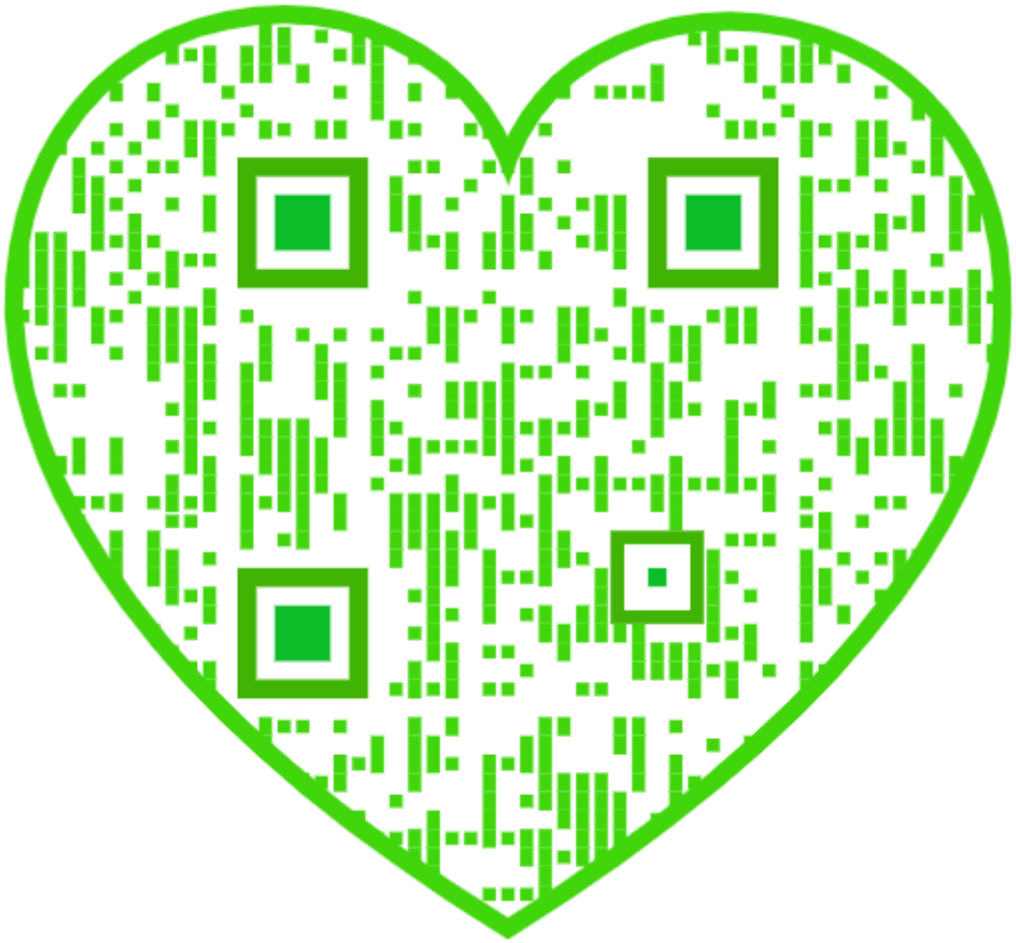

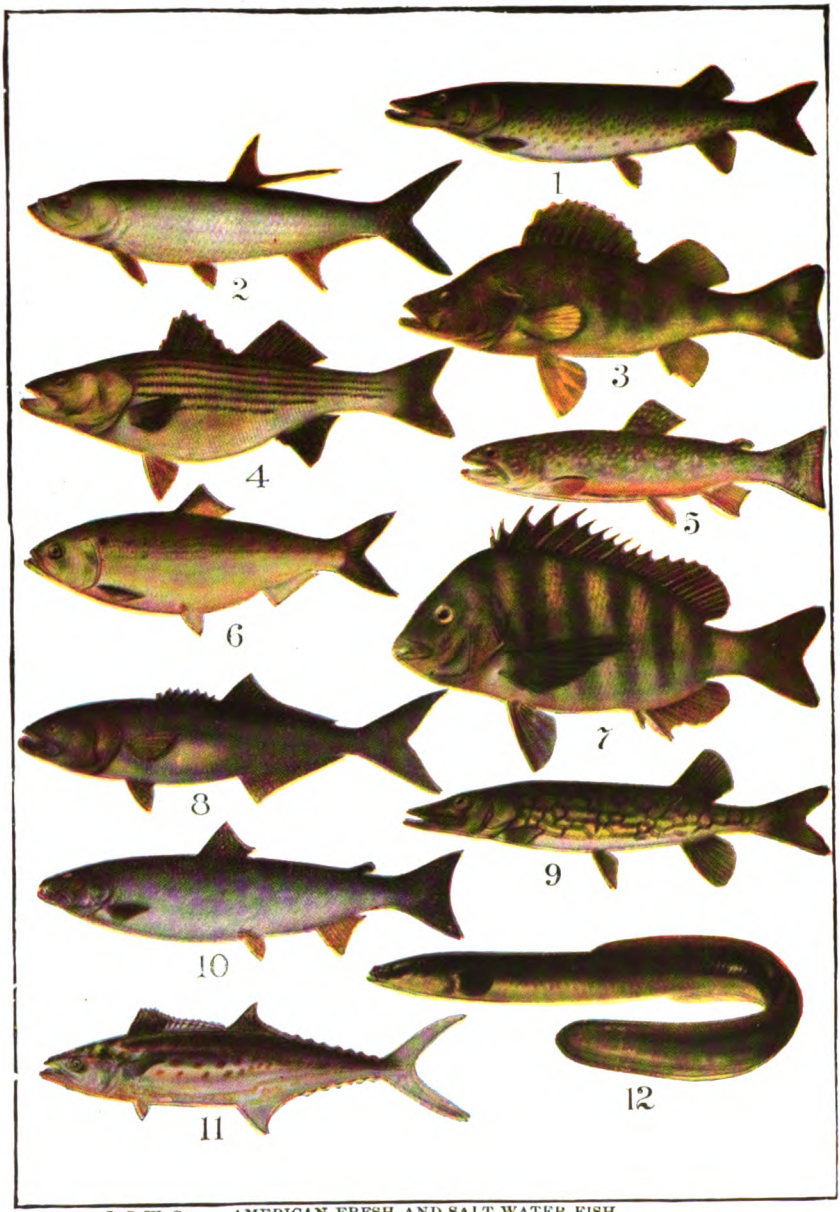

Copr. 1911, J. C. W. Co. AMERICAN FRESH AND SALT WATER FISH

1. Muskalonge. 2. Tarpon. 3. Yellow perch. 4. Striped bass. 5. Brook trout. 6. Shad. 7. Sheepshead. 8. Blue fish. 9. Pickerel. 10. Land-locked salmon. 11. Spanish mackerel. 12. Common eel.

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KEY TO PRONUNCIATION

Three methods are used to indicate the pronunciation of the words forming the headings of the separate articles:

(1) By dividing the word into syllables, and indicating the syllable or syllables to be accented. This method alone is followed where the pronunciation is entirely obvious. Where accent marks are omitted, the omission indicates that all syllables are given substantially the same value.

(2) Where the pronunciation differs from the spelling, the word is re-spelled phonetically, in addition to the accentuation.

(3) Where the sound values of the vowels are not sufficiently indicated merely by an attempt at phonetic spelling, the following system of diacritical marks is additionally employed to approximate the proper sounds as closely as may be done:

ā, as in *fate*, or in *bare*.
ä, as in *alms*, Fr. *âme*, Ger. **Bøhn**=ä of Indian names.
a, the same sound short or medium, as in Fr. *bal*, Ger. *Mann*.
ă, as in *fat*.
ą, as in *fall*.
ə, obscure, as in *rural*, similar to ŭ in *but*, ė in *her*: common in Indian names.
ē, as in *me*=ī in *machine*.
e, as in *met*.
ė, as in *her*.
ī, as in *pine*, or as *ei* in Ger. *Mein*.
i, as in *pin*, also used for the short sound corresponding to ē, as in French and Italian words.
eu, a long sound as in Fr. *jeûne*,= Ger. long ö, as in Söhne, Göthe (Goethe).
eu, corresponding sound short or medium, as in Fr. *peu*=Ger. ŏ short.
ō, as in *note*, *moan*.
o, as in *not*, *frog*.—that is, short or medium.
ŏ, as in *move*, *two*.
ū, as in *tube*.
u, as in *tub*: similar to ė and also to ə.
u, as in *bull*.
ü, as in Sc *abune*=Fr. û as in *dû*, Ger. ü long as in *grün*, *Bühne*.
ŭ, the corresponding short or medium sound, as in Fr. *but*, Ger. *Müller*.
oi, as in *oil*.
ou, as in *pound*; or as *au* in Ger. *Haus*.

The consonants, b, d, f, h, j, k, l, m, n, ng, p, sh, t, v, and z, when printed in Roman type, are always given their common English values in the transliteration of foreign words. The letter c is indicated by s or k, as the case may be. For the remaining consonant sounds the following symbols are employed:

ch is always as in *rich*.
ḍ, nearly as *th* in *this* = Sp. *d* in *Madrid*, etc.
g is always hard, as in *go*.
ḥ represents the guttural in Scotch *loch*, Ger. *nach*, also other similar gutturals.
ṇ, Fr. nasal *n* as in *bon*.
r represents both English *r*, and *r* in foreign words, in which it is generally much more strongly trilled.
s, always as in *so*.
th, as *th* in *thin*.
th, as *th* in *this*.
w always consonantal, as in *we*.
x = ks, which are used instead.
y always consonantal, as in *yea* (Fr. *ligne* would be re-written lēny).
zh, as *z* in pleasure = Fr. *j*.

WINSTON'S CUMULATIVE ENCYCLOPEDIA

VOLUME IV

E, the second vowel and the fifth letter of the English alphabet. It occurs more frequently in English words than any other letter of the alphabet. Its long or natural sound in English coincides with the sound of *i* in the Italian and French languages, as in *here, mere, me.* It has also another principal sound, a short one, heard in *met, men.* It has besides a sound like *a* in *bare,* as in *there, where,* etc., and the obscure sound which is heard in *her.* As a final letter in English it is generally silent, but it serves to indicate that the preceding vowel is to have its long sound, as in *mane, cane, plume.* When two *e*'s come together the sound is generally the same as that of the single *e* long, as in *deem, esteem, need* (comp. however *pre-exist,* etc.).

E in music, is the third note or degree of the diatonic scale, answering to the *mi* of the Italians and French.

Eadie (ē'di), JOHN, a Scottish preacher and theologian, born in 1810; died in 1876. He was educated at Glasgow University, and entered the ministry of the Secession Church, becoming in 1843 professor of Biblical literature in the Divinity Hall of the church, a post which he continued to hold after the Secession body was merged in the United Presbyterian Church (in 1847). Among his works are *Biblical Cyclopædia; Analytical Concordance to the Scriptures; Ecclesiastical Cyclopædia; Commentary on the Greek Text of Ephesians,* and similar works on Colossians, Philippians and Galatians; and *The English Bible.* He was one of the scholars engaged on the Revised Version of the New Testament.

Eadmer (ēd'mer), an English monk, the friend and biographer of St. Anselm. In 1120 he was chosen Bishop of St. Andrews; but as the Scottish king refused to recognize the right of the Archbishop of Canterbury to consecrate him, he returned to England and died a simple monk about 1124. Besides the life of St. Anselm, Eadmer wrote lives of St. Wilfrid, St. Dunstan, St. Odo, and other English saints, as well as a valuable history (*Historia Novorum*) of events in England and the English Church from 1066 to 1122.

Eads (ēdz), JAMES BUCHANAN, civil engineer, born at Lawrenceburg, Indiana, in 1820; died in 1887. He invented appliances for raising sunken steamers on the Western rivers, and during the Civil war constructed iron-clad steamers for the government. His greatest feats were the great steel bridge which he built over the Mississippi at St. Louis (1867-74) and the jetties by which he deepened for navigation the Southwest Pass or mouth of the Mississippi River. At a later date he projected the construction of a ship railway across the Isthmus of Tehuantepec.

Eagle (ē'gl), the general name of raptorial birds that form a group or subfamily (Aquilinæ) of the great family Falconidæ, which includes the eagles, falcons and hawks. The eagle is popularly regarded as the noblest and

Imperial Eagle—*Aquila imperialis.*

most courageous of the rapacious birds. It soars to a greater height than any other European bird, from which circumstance the ancients considered it as

the bird or messenger of Jove. The genus *Aquila*, which includes the most typical eagles, is distinguished by its long and powerful bill, the curve commencing at the cere, by its wings reaching to the tip of the tail, and by its tarsi being feathered to the toes. The imperial eagle (*A. imperiālis*) of Central Europe is probably the species to which the popular belief in the courage, strength and nobleness of eagles is to be traced. *A. chrysaëtus*, the golden eagle, measures over 6 feet from tip to tip of the expanded wings, and 3 feet from the beak to the end of the tail. The adults have the body brownish, becoming darker with age; the feathers of the head and neck pointed, and of a golden-red hue. This species is found all over the northern hemisphere. The Kirghis and other tribes of Central Asia use the golden eagle to kill antelopes, foxes and even wolves. The bald eagle (*Haliaëtus leucocephālus*), found in North America and Northeast Asia, is the symbol of the United States, though Franklin deplores the selection on account of his mean and dishonest habit of robbing the industrious osprey of the fish caught by him. Like all members of the genus, his diet is less restricted than that of the true eagles; and he even takes carrion. Another eagle (*Circaëtus gallicus*), the serpent eagle, or short-toed eagle, ranges through Southern Europe, Asia and especially North Africa. In structure and habits this bird approaches the buzzards. See also *Harpy Eagle*.

Eagle, as a symbol. The eagle first appears as a war standard among the Persians, through whom it reached the Egyptians. As the standard of the Roman armies it was first used by Marius, and later took the place of all the other emblems at the head of the legions. It was first made of wood, then of silver, and finally, under Cæsar, and his successors, of gold. In the mediæval ages the eagle became the heraldic emblem of the old German Empire, and was made double-headed in the fourteenth century. When the old German Empire ceased the double-headed eagle was retained by Austria. A single-headed eagle is the national military symbol of Prussia and the United States of America; the latter stands with outspread wings guarding a shield, with the motto *E pluribus unum*. The eagle is also the badge of several orders, the chief of which are the order of the *Black Eagle*, founded in 1701, and the highest order in Prussia; the order of the *Red Eagle*, also a Prussian order, and founded in 1705; the Russian order of the *White Eagle*, originally Polish, instituted in 1325.

Eagle. A gold coin of the currency of the United States, of the value of ten dollars. It was first coined in 1795. There are also half-eagles, quarter-eagles, and double-eagles.

Eagle-hawk, a name of birds (genus *Morphnus*) belonging to the eagle group, but smaller than the true eagles, with comparatively short wings and long legs, natives of South America.

Eagle-owl, one of a subfamily of owls (Buboninæ), the most remarkable species of which is the *Bubo maximus* (the great-horned owl), little inferior in size to the golden eagle. It is found in the mountainous parts of Central Europe. An allied species, the Virginian horned owl (*B. Virginiānus*), is found in almost every quarter of the United States.

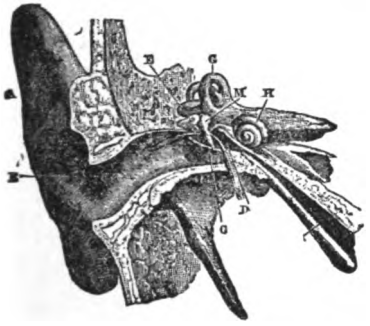
Eakins, Thomas, an American artist, born in Philadelphia in 1844. He became a professor in the Academy of the Fine Arts in that city, and produced notable works in sculpture and painting. Died in 1916.

Eames, (ēmz), Emma, American operatic soprano, was born in Shanghai, China, in 1867, of American parentage, her father being a lawyer in the International Courts at Shanghai. She studied at Boston, Paris, and Brussels, and made her début in *Romeo and Julict* in 1889. For many years she sang in opera in New York, London, Madrid and Paris. In 1891 she married Julian Story, the painter, and separating from him married Emilio de Gogorza, vocalist, in 1911.

Eames, Wilberforce, American bibliographer, born at Newark, N. J., in 1855. He was connected with library work from 1885, holding posts as librarian in many important libraries, including the Lenox and Astor Libraries, New York; the New York Public Library, and the Bibliological Society of America, of which he was librarian from its foundation in June, 1909. He edited Sabin's *Dictionary of Books Relating to America* and contributed important notes to Pilling's *Indian Bibliographies*. In 1892 he edited a comparative edition (with translation) of Columbus' *Letter to Sanches on the Discovery of America*.

Ear, the organ of hearing. It is situated at the side of the head, and in the higher vertebrates is divided into the outer, middle and inner ear. The external ear, which is a cartilaginous funnel for collecting the sound waves and directing them inwards, is composed of the *pavilion*, or projecting part, and of the *auditory canal*, which extends from the *concha*, or central hollow of the

pavilion, to the membrane of the *tympanum* or *drum*. This membrane is a partition stretched obliquely across the bottom of the auditory canal, which it separates from the middle ear or drum; it is semitransparent and very delicate. It vibrates with the waves of sound



The Ear of the Right Side.

which strike against it, and transmits the vibrations to certain little bones of the cavity of the tympanum. These bones, which have been named, respectively, the hammer (*malleus*), the anvil (*incus*) and the stirrup (*stapes*), transmit the vibrations to the internal ear, forming a chain communicating at one end with the membrane just mentioned, and at the other with the inner ear. The internal ear consists of a bony cavity called the *vestibule*, three *semicircular canals*, and a bony structure in the form of a spiral shell, called the *cochlea*. The vestibule communicates with the tympanum, the cochlea, and the semicircular canals, and is entered by branches of the nerve of hearing. The various parts of the internal ear, which together form the *osseous labyrinth*, are lodged in the hardest part of the temporal bone; they are lined throughout with a very thin membrane, and are full of a very thin and limpid fluid. They contain a structure of corresponding form called the *membranous labyrinth*, consisting of sacs and canals, also containing a fluid. Within the membranous canal of the cochlea is lodged the complicated apparatus which is believed to be the chief agent in the perception of sound. The middle ear communicates with the throat and pharynx by the eustachian tube, through which air from the mouth may be pressed against the membrane of the drum. In the external auditory canal of the ear is produced the cerumen or earwax, which if allowed to accumulate may cause deafness. The cut shows A, the pavilion, B, the external canal, C, the drum membrane partly removed, D, cavity of middle ear, E, anvil and M, hammer, the small bones communicating with the drum and vestibule, H, cochlea, G, semicircular canals, I, eustachian tube.

Ear-cockle, a disease in wheat caused by the presence in the grain of worms belonging to the genus *Vibrio*. Called in some parts of England *purples*.

Ear of Dionysius, a large funnel or shell, with flexible tube, for concentrating sound; a kind of ear trumpet. Its name comes from the traditional device by which Dionysius, tyrant of Syracuse, heard the talk of his prisoners in their dungeons.

Earl (erl), a degree of the British nobility between marquis and viscount, the title of highest antiquity in England. The title was made hereditary by William the Conqueror, and for a time was used interchangeably with that of *count*, the corresponding title on the continent. The wife of an earl is still called a *countess*. An earl's coronet is composed of eight pearls raised upon points, with small leaves between, above the rim. See *Coronet*.

Earle, ALICE MORSE, author, born at Worcester, Massachusetts, in 1853; died in 1911. She wrote extensively on colonial manners and customs in New England and New York, her works including *Home Life in Colonial Days*, *Childhood in the Colonies*, *Two Centuries of Costume in America*, etc.

Earle, JOHN, an English bishop and writer, born about 1601; died in 1665. He was educated at Oxford, and after writing some short poems gave to the world anonymously in 1628 *Microcosmographie, or a Piece of the World discovered in Essays and Characters*—a work full of wit, humor and admirable character painting. He was tutor to Charles II, accompanied him during his exile, and was held by him in the highest esteem. In 1662 he was consecrated Bishop of Worcester, and next year was translated to Salisbury.

Earle, JOHN, an English philologist, born at Elston, South Devon, in 1824. In 1876 he became professor of Anglo-Saxon at the University of Oxford. He published many philological works, including *The Philology of the English Tongue*, *Anglo-Saxon Literature*, *English Prose*, *The Psalter of 1539*, etc.

Earle, PLINY, physician, was born at Leicester, Massachusetts, in 1809; died in 1892. He became a prominent worker among the insane, being resident physician at the Frankford In-

sane Asylum, Philadelphia, 1840-42; at Bloomingdale, New York, 1844-49; and superintendent of the Massachusetts State Hospital for the Insane, 1864-85. He studied the European methods of treating the insane and published many valuable works on the subject.

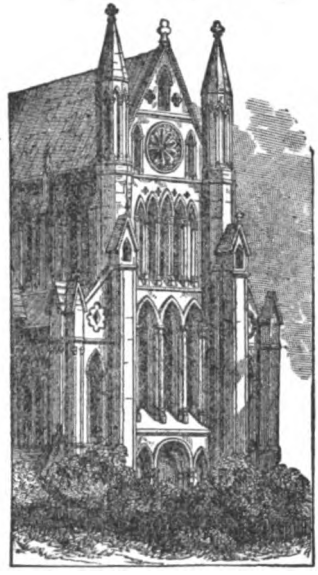
Earl-marshal, a great officer of England, who had, anciently, several courts under his jurisdiction, as the court of chivalry and the court of honor. He is the head of the College of Arms (Heralds' College), grants armorial bearings, and determines all claims in connection with them. The office is hereditary in the family of the Howards. There was also an earl-marshal of Scotland, the office being hereditary in the Keith family.

Earlom (erl'om), RICHARD, an English mezzotinto engraver, born in 1743; died in 1822. His engravings from Reynolds, Hogarth, Van Huysum, etc., are very fine.

Early (er'li), JUBAL A., an American soldier, born in Franklin Co., Virginia, in 1816; died in 1894. He was graduated at West Point in 1837, served in the Florida and Mexican wars, and in 1861 joined the Confederate army, commanding a division of Lee's army at Gettysburg. In 1864 he made a cavalry raid on Chambersburg, Pennsylvania. Placed in command in the Shenandoah Valley, he was worsted there by General Sheridan. He practiced law after the war.

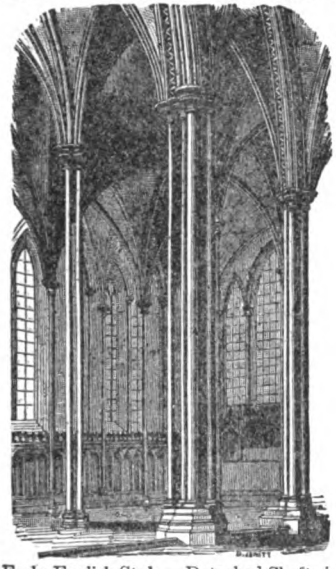
Early English Architecture,

the first of the Pointed or Gothic styles of architecture that prevailed in England. It succeeded the Norman in the Reign of Richard I (1189), and continued to the end of the reign of Henry II in 1272, a period of 123 years, when it gradually merged into the Decorated style. One of the leading peculiarities in this style is the form of the windows, which are narrow in proportion to their height, and terminate in a pointed arch, resembling the blade of a lancet. Throughout the early period of the style they are very plain, particularly in small churches; but in cathedrals and other large buildings the windows, frequently combined two or more together, are carried to a great height, are richly and deeply molded, and the jambs ornamented with slender shafts. On the eastern and western fronts of small churches the windows are often combined in this manner, with a circular window above and a richly molded door below; but in large buildings there is often more than one range of windows, and the combinations are very various. Though separated on the outside, these lancets are in the interior combined into one design, thus giving the first idea of a compound window. The doorways are in general pointed, and in rich buildings sometimes double; they are usually molded, and enriched with the tooth ornament. The buttresses are often very bold and prominent, and are frequently carried up to the top of the building with but little diminution, and terminate in acutely-pointed pediments, which, when raised above the parapet, produce in some degree the effect of pinnacles. In this style, likewise, flying buttresses were first introduced (see *Buttresses*), and the buttresses themselves much increased in projection owing to the comparative lightness of the walls, which required some counter-support to resist the outward pressure of the vaulting. The roof in the Early English style appears always to have been highly pitched, and the towers surmounted by lofty pointed spires, as at Salisbury Cathedral (illustrated at *Gothic*). In the interior the arches are usually lancet-shaped, and the pillars often reduced to very slender proportions. As if to give still greater lightness of appearance, they are frequently made up of a center pillar, surrounded



Early English Style.—Northwest Transept of Beverley Minster.

by slight detached shafts, only connected with the pillar by their capitals and bases, and bands of metal placed at intervals. These shafts are generally of Purbeck marble, the pillar itself being of stone, and from their extreme slenderness they sometimes appear as if quite inadequate to support the weight above



Early English Style.—Detached Shafts in Lady Chapel, Salisbury Cathedral.

them. Some of the best examples are to be seen in Salisbury Cathedral. The architects of this style carried their ideas of lightness to the utmost limits of prudence; and their successors have been afraid to imitate their example. The abacus of the capitals is generally made up of two bold, round moldings, with a deep hollow between. The foliage is peculiar, generally very gracefully drawn, and thrown into elegant curves; it is usually termed *stiff-leaved*, from the circumstance of its rising with a stiff stem from the neckhold of the capital. The trefoil is commonly imitated, and is very characteristic of the style. The moldings of this style have great boldness, and produce a striking effect of light and shade. They consist chiefly of rounds separated by deep hollows, in which a peculiar ornament, called the *dog's-tooth*, is used, whenever ornament can be introduced. This ornament is as characteristic of the Early English as the zigzag is of the Norman. See *Dog's-tooth*.

Early English Capital, Salisbury.

Earnest (er'nest), in law, any sum paid in advance, to bind parties to the performance of a verbal agreement, or something given by a buyer to a seller as a pledge of adherence to a bargain. The party is then obliged to abide by his bargain, and is not discharged upon forfeiting his earnest. In the United States the general view is, that the sum paid as earnest, however small, is part of the price.

Ear-ring, an ornament for the ear, consisting of a ring or hook passing through the lobe, with a pendant of diamonds, pearls, or other jewels frequently attached. Ear-rings have been commonly worn among the oriental nations, and by both sexes, from the earliest times. Many Egyptian ear-rings of beautiful device have been found. Among the Greeks and Romans they were not so commonly worn by men as by women. They were somewhat generally worn during mediæval and modern times, though the use of them has now greatly decreased and in the United States has practically vanished. Among savage tribes enormous weights are often carried in the ears, their lobes being greatly distended.

Ear-shell, a name given to certain univalve molluscs of the genus *Haliōtis* (which see).

Earth (erth), the planet which we inhabit, a nearly spherical body which every twenty-four hours rotates from west to east around an imaginary line called its axis—this axis having as its extremities the north and south poles respectively—while in the course of a year it completes a revolution around the sun. To an observer whose view is not obstructed, any part of the earth presents itself as a circular and horizontal expanse, on the circumference of which the heavens appear to rest. Accordingly, in remote antiquity, the earth was regarded as a flat, circular body, floating on the water. But even in antiquity the spherical form of the earth began to be suspected. It is only on this supposition that we can explain how the horizon of vision grows wider and wider the higher the position we choose, how the tops of towers and mountains at a distance become visible before the bases, how the hull of a ship disappears first as she sails away, and how, as we go from the poles towards the equator, new

stars become visible. Besides these proofs, there are many others, such as the circular shadow of the earth seen on the moon during an eclipse, the gradual appearance and disappearance of the sun, and especially the fact that since 1519 the earth has been regularly circumnavigated.

The earth is not, however, an exact sphere, but is very slightly flattened at the poles, so as to have the form known as an *oblate spheroid*. In this way the *polar diameter*, or diameter from pole to pole, is shorter than the diameter at right angles to this—the *equatorial diameter*. The most accurate measurements make the polar diameter about 27 miles less than the equatorial, the equatorial diameter being found to be 7925.6 miles, and the polar 7899.14. The earth is regarded as divided into two halves—the northern and the southern hemisphere—by the *equator*, an imaginary line going right around it midway between the poles. In order to indicate with precision the position of places on the earth, additional circles are imagined to intersect one another on the surface in such a manner that those of the one set all pass through both poles, while those of the other are drawn parallel to the equator. The former are called *meridians*, the latter *parallels of latitude*, and by them we can tell the latitude and longitude, and thus the exact position of any place.

Many experiments by various methods have been made in order to determine the average density of the earth, that is, the quantity of matter it contains. Among these methods may be mentioned: (1) that of determining the attraction of a mountain on the direction of a plumb-line and calculating from thence the density of the earth; (2) that founded on the difference of oscillation in a pendulum when placed at the summit of a mountain and when at the sea-level; (3) the converse of the preceding method, by the determination of the difference of gravity at the top and the bottom of a deep mine, by pendulum experiments: (4) Cavendish's experiment with the torsion balance, which attempts to compare the attractive force of two large lead balls over other two small lead balls, with that exercised by the earth. From these and other experiments it has been calculated, taking the mean of all results, that the density of the earth is to that of water as 5.639 to 1.

The earth, in common with the other planets, moves around the sun, completing its revolution in about 365 days and six hours, and thus forming our common year. The orbit of the earth is an ellipse, with the sun in one of its foci. Hence the earth is not equally distant from the sun in all parts of the year; being about 3,000,000 miles nearer at one time than another, its least distance (*perihelion* distance) according to recent calculations about 91,300,000 miles, its greatest (*aphelion* distance) 94,300,000, and the mean distance, or half the length of the long axis of the orbit, 92,800,000 miles. From this it may be calculated that the velocity of the earth in its orbit is about 18 miles a second. In winter (speaking of the northern hemisphere) the earth is nearest the sun and in summer farthest from it; for the difference in the summer and winter temperature is not occasioned by the greater or less distance of the earth from the sun, but by the more or less oblique direction of the sun's rays. The passage of the earth round its orbit causes the sun to appear as if it described a similar orbit in the heavens; and hence it is that at one time of the year one group of stars is seen in the neighborhood of the sun at sunrise and sunset and at another time another group. This apparent path of the sun is the *ecliptic*, and corresponds with what would be the path of the earth as seen from the sun; and the groups of stars through which the sun successively passes form the zodiac.

The earth's daily motion about its own axis takes place, according to mean time, in twenty-three hours, fifty-six minutes and four seconds. The diurnal revolution is the occasion of the alternation of day and night. As the axis on which the earth performs its diurnal rotation forms with the plane of its path about the sun an angle of 23½° (which angle also represents that between the plane of the ecliptic and the plane of the earth's equator), the sun ascends in the heavens, from March 21 to June 21 (the summer *solstice*), about 23½° above the equator towards the north pole, and descends again towards the equator from June 21 to September 23; it then sinks till December 21 (the winter *solstice*), about 23½° below the equator, towards the south pole, and returns again to the equator by March 21. This arrangement is the cause of the seasons, and the inequality of day and night attending them. For all countries lying beyond the equator, day and night are equal only twice in the year (at the *equinoxes*). At the summer solstice the north pole of the earth is turned towards the sun, and the south pole away from it, and for 23½° round the former there is a

period of longer or shorter duration during which the sun is continually above the horizon for more than 24 hours, while round the latter there is an equal extent of surface within which the sun for similar periods is below the horizon. (See *Day.*) The reverse state of matters occurs at the winter solstice. The circles bounding these regions are called respectively, the *arctic* and the *antarctic* circle, and the regions themselves the *polar* or *frigid zones.* Throughout a region extending to 23½° on each side of the equator the sun is directly overhead at every point in succession twice in the year. The circles which bound this region are called the *tropics*, that in the northern hemisphere being the tropic of *Cancer*, that in the southern the tropic of *Capricorn*, while the region between is the *torrid zone.* The regions between the tropics and the polar circles are, respectively, the *north* and *south temperate zones.*

From the evidence furnished by volcanoes, hot springs, sinking of mines, etc., it is known that the earth has a high internal temperature of its own. Taking the average of the various observed rates of increase, this temperature seems to increase 1° Fahr. for every 60 feet of descent. Assuming this to continue, the rocks at a depth of 2 miles would be as hot as boiling water, and at a depth of 50 miles the heat would equal that which at the surface would melt every known solid. This being so, various theories as to the internal condition of the earth have been proposed: (1) That a thin envelope or crust surrounds a molten interior. It can be shown, however, that as tides must be produced in such a molten mass the cool outer crust would be unable to withstand the enormous force of these unless it were about 2000 miles thick. (2) That the interior is solid, with spaces here and there filled with liquid or gaseous material. This theory assumes that there are within the earth enormous cavities filled with molten rock, which escapes when local pressure is removed in the form of volcanic outbursts. (3) That the earth consists of a thin crust, a large solid nucleus and a liquid film between the nucleus and the crust; the temperature at the center being not much greater than comparatively near the surface. (4) That the earth is solid to the center, but any part may become liquid if local pressure is removed. We know that if the pressure on a solid be increased the melting point is correspondingly raised; now the pressure at the center of the earth, or even at the depth of 50 or 100 miles, must be something enormous, and probably is so great as to keep the rocks there permanently in a solid condition, notwithstanding the heat. This last theory is considered the most probable. On the supposition of its correctness volcanoes might be explained by supposing that at certain points here and there pressure is removed by the elevations of portions of the earth's surface which are constantly taking place, and that this allows the rocks to liquefy. Water may then percolate down to these liquid rocks, and there being converted into steam, produce the various volcanic phenomena.

The earth (like the other planets) is believed to have condensed and solidified from a gaseous or nebular condition, and to have once had a far higher temperature than now. If such were the case the outer surface, losing heat by radiation, would be the first part to cool quickly; while the interior, losing its heat by conduction, would not cool so rapidly, and therefore would naturally have a higher temperature than the portion at the surface. This is what all observations indicate the condition of the earth to be, and the shape of the earth also indicates that it must once have been in a fluid state. Even the time at which it was in the fluid state has been roughly calculated by Sir W. Thomson, whose estimate makes it about 200,000,000 years ago. But all such calculations are very doubtful in view of the paucity of known facts bearing on the situation. See *Nebular Hypothesis.*

Another feature that the earth as a whole presents is its magnetism. When a magnetic needle is balanced on a point it remains at rest in one position only, pointing then nearly due north and south. This can be explained only on the supposition that the earth acts as a great magnet. It has, in fact, two poles —a north and a south magnetic pole— which are not very far from, but by no means coincident with, the geographical poles. There is also a neutral line or magnetic equator, which does not greatly diverge from the geographical equator. The earth acts upon all magnets as they act upon each other, and it is for this reason that they point north and south.

The surface of the earth contains over 196,000,000 square miles, of which scarcely a third part is dry land, the remaining two-thirds being water. The land is arranged into masses of irregular shape and size, the greatest connected mass being in the eastern hemisphere. The chief masses receive the name of continents, detached masses of smaller

size forming islands. The surface of the land is variously diversified, exhibiting mountains, valleys, plains, plateaus, deserts, etc. The water area of the earth is divided into oceans, seas, bays, gulfs, etc., while rivers and lakes may be regarded as features of the land surface. The great phenomena of the oceans are currents and tides. The population of the whole earth is estimated at about 1,500,000,000. The earth is attended by the moon as a subordinate or subsidiary planet. See also such articles as *Climate*, *Currents*, *Ocean*, *Earthquake*, *Seasons*, etc.

Earth-closet, a place in which the fæces from the human body are received in a quantity of earth. The advantages of the earth-closet system are due to the fact that dry earth is one of the best disinfectants and deodorizers, and that the compound formed by the combination of the fæcal matter and the earth is valuable and easily applied as manure. In large cities the earth-closet system would hardly be practicable on account of the expense of preparing and storing large quantities of earth, but in agricultural districts the system might be employed with great advantage.

Earth-currents, violent electrical disturbances of the nature of transient currents, which rush in one direction or the other, and by which telegraph lines, and particularly long submarine lines, are constantly troubled. Their origin and nature are not thoroughly understood, but they are found to be very intimately connected with the perturbations of terrestrial magnetism called *magnetic storms*, and these, it is well known, are closely connected both with the appearance of the *aurora borealis* and with the occurrence of the sun's spots.

Earthenware (er'thn-wār), a name applied to the commoner sorts of pottery ware. See *Pottery*.) Some of the varieties of earthenware, such as Majolica, Delft ware, Faïence and Palissy ware, are not only glazed, but are elaborately colored and enameled and ornamented with raised figures of various kinds.

Earth-houses, a name generally given throughout Scotland to underground buildings, also known as 'Picts' houses' or 'Picts' dwellings.' The earth-house in its simplest form consists of a single irregular-shaped chamber, formed of unhewn stones, the side walls gradually converging towards the top until they can be roofed by stones of 4 to 5 feet in width, all covered in by a mound of earth rising slightly above the level of the surrounding district. In the more advanced form of these structures two or three chambers are found. Earth-houses are frequent in the northeast of Scotland, occasionally thirty or forty being found in the same locality. Querns, bones, deers' horns, earthen vessels, cups and implements of bone, stone celts, bronze swords, and the like, are occasionally found in connection with them. Very similar structures, known as beehive houses, occur also in Ireland.

Earthnut, the *Bunium flexuōsum*, an unbelliferous plant common in woods and fields in Britain. The leaves are ternately divided, and the small, white flowers are in terminal umbels. The tuber or nut is about 4 or 6 inches below the surface, at the termination of a long, slender root. It is brown, the size of a chestnut, of a sweetish, farinaceous nature, resembling in taste the common chestnut. Swine are very fond of the nuts, and fatten rapidly where they are abundant. The name is frequently applied to *Bunium Bulbocastănum*, which has a similar tuber. The earthnut of Egypt is the tuber of Cyperus *rotundus* and other species of the same genus, that of China the subterranean pods of *Arachis hypogœa*, a leguminuous plant.

Earthquake (erth'kwāk), a shaking of certain parts of the earth's surface, produced by causes not perceivable by our senses. This motion occurs in very different ways, having sometimes a perpendicular, sometimes a horizontally undulating, and sometimes a whirling motion. It also varies much in degrees of violence, from a shock which is hardly perceptible to one which leaves wide chasms and changes the appearance of the ground itself. During these shocks sometimes smoke and flames, but more frequently stones and torrents of water, are discharged. There is little doubt that earthquakes and volcanic eruptions are kindred phenomena, the latter differing from the former principally in proceeding from a permanent crater. All observations go to prove that both are due to disruptions produced by internal heat at a great depth beneath the surface of the earth. Of the particular way in which this force works, however, there are various theories. It has been thought by some that the center of earthquakes and volcanic disturbances is always near the sea or other large supplies of water, and that the disturbances are directly caused by the filtration of the water down to igneous matter, and

the consequent generation of vast quantities of steam, which frees itself by explosion. (See *Earth.*) Others have sought to explain earthquakes as part of the phenomena of a planet cooling at the surface or to the yielding of strata so as to slip downward upon each other. The most remarkable earthquakes of modern times are those which destroyed Lima in 1746, and Lisbon in 1755; others more recent are the earthquakes that visited Calabria in 1857, Peru and Ecuador in 1868, Java and Sumatra in 1883, Charleston in 1886 and Japan in 1901. The twentieth century has been notable for earthquakes of exceptional severity, including those of San Francisco and Valparaiso in 1906; of Kingston, Jamaica, in 1907; of Messina, Sicily, 1908 (loss of life about 150,000), and of Central Italy, in the region surrounding Avezzano, in 1915 (loss of life about 35,000).

Earths, a term applied to certain tasteless, inodorous, dry, uninflammable, nonvolatile, insoluble substances, not easily fusible, and of a moderate specific gravity, which constitute by far the greatest part of the gravel and soil that go to make up the mountains, valleys and plains of our globe. They include *lime, baryta, strontia, magnesia, alumina,* etc. The earths were regarded as simple bodies until Sir H. Davy proved them to be compounds of oxygen with metals.

Earth-shine, in astronomy, a name given to the faint light visible on the part of the moon not illuminated by the sun, due to the illumination of that portion by the light which the earth reflects on her. It is most conspicuous when the illuminated part of the disc is at its smallest, as soon after new moon. This phenomenon is popularly described as 'the old moon in the new moon's arms.'

Earth-tongue, the popular name given to club-shaped fungi of the genus *Geoglossum,* found in lawns and grassy pastures.

Earth-tremors, slight vibrations of portions of the earth's surface, which may be noted by means of special instruments, their cause not being known.

Earthworks (in fortification) are military works formed chiefly of earth and designed either as permanent or temporary defenses. They are cheaper, more easily repaired, and expose their defenders to less risk from broken stone than stoneworks.

Earthworm (*Lumbricus terrestris*), a genus of common worms, order Oligochæta, belonging to the abranchiate (having no branchiæ or external respiratory organs) section of the class Annelida. They have a long, cylindrical body, divided by transverse furrows into numerous rings. The mouth is destitute of teeth, and they have no eyes, tentacles or cirrhi. They are hermaphrodite. The common earthworm may grow to be nearly a foot in length. It subsists on roots, woody fibers, animal matter, etc. It moves by the contractions of successive parts of the body aided by a double row of bristles. Worms are of great service to the agriculturist by loosening the soil and increasing its depth. This is chiefly the result of their mode of nourishment, since they deposit the soil they have swallowed, after digestion, in heaps called *worm castings,* which bring up rich, fine soil to the surface, gradually covering the upper layer, sometimes to the extent of several inches.

Ear-trumpet, an artificial instrument for aiding the collection of the vibrations or waves of sound, and carrying them in an intensified form to the internal parts of the ear. They are generally made of tin, vulcanite, gutta-percha, etc., and are of various forms. A small kind known as ear-cornets or acoustic auricles, attached to the ear by a spring, are sometimes used in slight cases of deafness.

Earwig (ēr'wig; *Forficŭla*), a common orthopterous insect whose name is derived from its supposed habit of insinuating itself into the ears of persons. This is practically impossible, yet the notion is widely spread, as appears from the names given to the earwig in different languages, as in French *perce-oreille* (pierce-ear), in German *ohrenhöhler* (ear-borer). Much damage is sustained by gardeners from the depredations of these insects among fruit and tender vegetables, which constitute their proper food. The earwig is about three-quarters of an inch in length, having the wings folded under very short and truncate elytra or wingcases, and the extremity of the abdomen armed with a horny forceps.

Earwig (*Forficŭla auricularia*).

Easel (ē'zel), the frame on which an artist supports his canvas. It is usually made to fold up after use.

Easement (ēz'ment), in law, a right or privilege which one proprietor may have to use the land of another in connection with the needs of his own land, as the use of a way, a

water-course, etc. The right to an easement may be acquired either by grant or by uninterrupted enjoyment for a period of years.

East (ēst), one of the four cardinal points, being the point in the heavens where the sun is seen to rise at the equinox, or the corresponding point on the earth; that point of the horizon lying on the right hand when one's face is turned towards the north pole. By *the East*, in an indefinite sense, is often meant Asia Minor, Syria, Arabia, Persia, India, China, etc.

Eastbourne (ēst'burn), a watering place of England, county of Sussex, situated on the English Channel, near Beachy Head. The town is handsomely built, having fine parades and well-planted walks and drives. Pop. 52,544.

East Cape, the most easterly point of Asia, projecting into Bering Strait nearly opposite Cape Prince of Wales in Alaska.

East Chicago, a city of Lake Co., Indiana, 23 miles S. E. of Chicago. It has locomotive, bridge, steel, iron and chemical works, lumber factories, etc. Pop. 23,000.

East Cleveland, a city of Cuyahoga Co., Ohio, 8 miles E. N. E. of Cleveland, with electric railway connection. Pop. 13,000.

East Conemaugh, a borough of Cambria Co., Pennsylvania, near Johnstown. It has iron furnaces. Pop. 5046.

Easter (ēs'ter), the festival commemorating the resurrection of Christ, observed in the Roman Catholic, the Greek, Anglican, Lutheran and other branches of the Christian church. By the first Christians it was considered to continue the feast of the *passover*, at which the paschal lamb, a type of Christ, was sacrificed. Hence its name in Greek (*pascha*), French (*pâques*), and other Romance languages, is taken from the Hebrew *pesach*, passover. The English name comes from the Anglo-Saxon *Eostre*, a goddess of light or spring, whose festival was celebrated in April. There was long a dispute in the Christian church as to the proper time for holding Easter, the Christians of the East celebrating it on the same day as that on which the Jewish passover fell, that is, the fourteenth of Nisan (hence they were called *quarto decimani*), while the majority of the church celebrated it on the Sunday next after this day. The controversy was decided by the Council of Nice (Nicæa) in 325, which settled that it was to be reckoned as at present, namely, that Easter is the first Sunday after the full moon which happens upon or next after the 21st of March, and if the full moon happens on a Sunday, Easter-day is the Sunday after, but, properly speaking, for the 'full moon' in the above the 'fourteenth day of the moon' should be substituted.

Easter Egg, a colored or decorated egg, or something of egg shape, as candy, used as a gift at Easter. The custom is an ancient one, antedating Christianity. As the egg is looked upon as a symbol of life, it may have originated to signify the birth of the year or of the spring. When adopted by the Church Fathers for the Easter festival, it was looked upon as symbolizing the birth into a new life. The coloring of the egg was probably adopted simply to please children.

Easter Island, an island in the South Pacific Ocean, lon. 109° 17′ w.; 27° 6′ s. It is of a triangular form, one side about 12 miles long, the other two about 9 each; highest point, 1200 feet. The soil is fertile, but is little cultivated. There are some remarkable sculptures on this island, consisting of gigantic stone images, of unknown origin, in great numbers. The island belongs to Chile, and is utilized as a grazing farm for sheep and cattle. The inhabitants are Malayo-Polynesians, and number only about 150, the bulk of them having dwindled away as well from polyandry as from emigration.

Eastern Archipelago. See *Malay Archipelago.*

Eastern Churches, a collective term for the Greek, Armenian, Coptic, Abyssinian, Syrian and other kindred churches.

Eastern Empire. See *Byzantine Empire.*

Eastern Question, the name formerly applied to the diplomatic and national interests affected by the gradual retrocession of the Turkish Empire in Europe, and the problem of disposing of the territory thus left, or presumably to be left. Bulgaria, Roumania, Servia and Greece are the new states which have naturally arisen on the withdrawal of the Turkish power, and their history in connection with the respective policies of England, France, Austria and Russia towards them is the history of the phases of the 'Eastern Question' so far. The Crimean war of 1854-56, with the Treaty of Paris which followed after it, and the Russo-Turkish war of 1877-78, with the Treaty of Berlin, are among the events connected

therewith. As an international problem it has largely lost its importance, and the term is now rarely used.

Eastern Roumelia, a former portion of the Turkish dominions in Europe lying on the south of Bulgaria, from which it is separated by the Balkan Mountains; area, 13,500 sq. miles. The country is fertile, but agriculture is backward; wheat, wine, tobacco, etc., are produced; timber is abundant. The chief town is Philippopolis. East Roumelia was constituted an autonomous province of Turkey by the Treaty of Berlin in 1878, but in 1885 a revolution occurred and the province was proclaimed a part of Bulgaria. (See *Bulgaria.*)

Eastern Shore, a section of Maryland, the eastern of the two districts into which the State is divided by the Susquehanna River and Chesapeake Bay. It contains about one-third of the area of the State, and is a level and sandy region, with some rounded hills in the north. In the south are swampy tracts and patches of woodland. The soil is in general fertile, the streams deep and navigable.

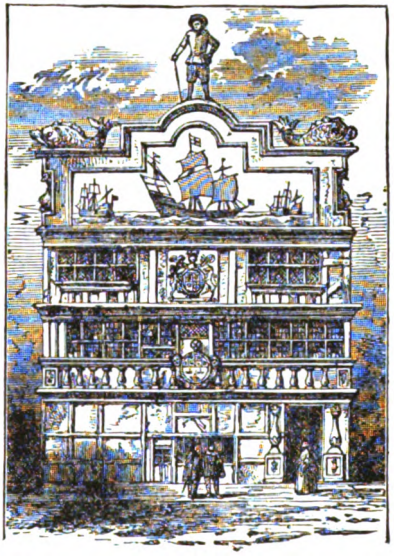
Eastern States. The New England States of the American Union. They are often thus called from their geographical position, in distinction from the Middle, Southern and Western States.

East Ham, a town of Essex Co., England, adjacent to Barking and constituting an eastern suburb of London. Pop. (1911) 133,504.

Easthampton, a town of Hampshire Co., Massachusetts, 4 miles from Northampton. It has manufactures of buttons, rubber goods, cotton yarns, etc. Pop. 8524.

East Hartford, a village in East Hartford township (town), Hartford Co., Connecticut, on the Connecticut River, opposite Hartford. It has paper works and tobacco interests. Pop. of town 8138.

East India Company, a great English company, originally simply a trading association, which played an important part in the history of Hindustan. It was formed in 1599 in London, with a subscribed capital of about £30,000, for the purpose of trading with the East Indies. A charter was granted to it by Queen Elizabeth on December 31, 1600, for fifteen years, renewable for a similar period. In this charter the company is styled, 'The Governor and Company of the Merchants of London trading into the East Indies.' The first voyages resulted in large profits. The illustration represents what is believed to have been the original headquarters of the Company, from a unique engraving in the British Museum. In 1609 the charter was renewed by James I, and made perpetual, reserving power to the crown to recall it at three years' notice. Additional power was granted to the Company of seizing and confiscating



The Old East India House, Leadenhall Street (1650).

ships and goods of contraband traders, either in the British dominions or in any of the places where they were authorized to trade. Among the motives which had induced the Company to press for this renewal of their charter was the necessity they had experienced from the jealousy of the Dutch and Portuguese to send out vessels fitted not only for trade, but for defense and indeed attack. Accordingly, Captain Best, who commanded the eighth expedition, attacked four Portuguese war galleons, convoying 200 sail of merchantmen, off Surat, and gained a complete victory, which so impressed the Great Mogul that he immediately made a treaty with Captain Best, giving the English full liberty to trade in his dominions. This treaty was concluded on February 6, 1613. In 1619 a treaty was made with the Dutch, by which the two companies were to work in harmony for twenty years but in

1629 the Dutch massacred the leading members of the English factory at Amboyna. In the feeble reigns of James and Charles I, however, the outrage remained unredressed, and the English Company, ill supported by the crown, was often reduced to great straits. Their trade, impeded by the Dutch, became unprofitable, and, to add to their difficulties, Charles I in 1635, gave a license to a rival company. At length, under Cromwell, the Company received a new charter. A territorial footing had been acquired in Madras in 1640, to which settlement was given the control of all the factories in Bengal and the Coromandel coast, the supreme council in India still remaining at Surat. A new charter, granted by Charles II in 1660, enlarged the powers of the Company, giving it political and judicial authority in the factories and colonies established by it, with the right to appoint governors. On the Revolution of 1688 the Company was involved in new difficulties, and in 1692 the Commons presented an address to the crown praying for their dissolution. At this time, by an accidental failure to pay a tax upon their stock, the Company formally forfeited their charter, and were compelled to accept its renewal with the important proviso of a reservation to the crown of the right to alter or modify its conditions. The misconduct of the English Company so strengthened its enemies that, in spite of all its opposition, a resolution in favor of the formation of a new company passed the House of Commons on May 4, 1698. This act provided for the extinction of the old company, but an amalgamation was eventually arranged in 1708. The possessions of the old company at the time of amalgamation, upon which the valuation of £330,000 was placed in 1700, included a large number of places in India, a footing having been by this time acquired in each of the three presidencies, besides possessions in Persia, Cochin-China, Sumatra, etc. The dividends of the Company rose rapidly after the amalgamation, and finally settled at 8 per cent.; and it procured without difficulty, at various periods, a prolongation of its exclusive privileges until 1780, still with three years' notice. In the meantime the French possessions had, as well as the English, been growing in power and importance in the East, and on the outbreak of the war of the Austrian Succession, in 1741, commenced those struggles (Clive being the first great English leader) by which a mercantile company was led on to establish British supremacy over nearly the whole of India. (See *India*.) In 1766 the right of the Company to acquire territorial possessions formed a subject of parliamentary inquiry; and the question of the political rights of the Company being thus opened up, the ministry began to act on their view of it by sending out a crown plenipotentiary to India. A regulating act was passed in 1773 remodeling the powers of the Company, and placing it completely under the control of parliament, providing for the establishment by the crown of courts of judicature in India. The charter, which expired in 1780, was renewed till 1791. The renewal act provided that the Company, which was already bound to submit to the government all despatches received from India, should submit for approval all despatches proposed to be transmitted thither. In 1784 another act established a board, afterwards known as the board of control, to superintend, direct and control all acts, operations and concerns relating to the civil and military government or revenues of India. The board was to consist of a principal secretary of state, the chancellor of the exchequer and four privy-councilors nominated by the crown. The directors of the Company were bound to submit all their papers except those referring to commercial matters to this board, and obey its instructions. From this time the political power of the Company was little more than nominal. While the right of nominating the servants of the Company was still left to the directors, the absolute right of recall was vested in the crown. A subsequent declaratory bill regulated the power of the board of control to send out troops at the expense of the Company. In 1813 the charter was renewed on condition that the right of exclusive trade should be restricted to China, while the India trade should be thrown open to all British subjects. A church establishment for India was also provided by this act. The appointment of governors-general, governors and commanders-in-chief was no longer to be valid without the direct sanction of the crown. The renewal of the Company's charter in 1834 took place amid continued opposition to their mercantile and even to their legislative privileges. It continued them in all their possessions except the island of St. Helena, put an end to the exclusive right of trade with China, and enacted that the Company should with all convenient speed close their commercial business, and make sale of all their property not retained for govern-

ment purposes; all their other property was to be held in trust for the crown, which was to take over their debts and guarantee their dividend out of the revenues of India. The stock was valued at £6,000,000, which was to bear interest at 10 per cent., and be redeemable after April 30, 1874, on payment of £12,000,000. The Company was now fairly in liquidation, and on the outbreak of the mutiny of 1857 it was felt indispensable to vest the government of India directly in the crown, and this was accordingly done in 1858. Thenceforth the Company existed only for the purpose of receiving payment of its capital, and of the dividends due upon capital until its repayment.

East Indies, the name loosely applied to Hindustan, the Indo-Chinese peninsula, and a portion of the Eastern Archipelago, but excluding the Philippine Islands, New Guinea and Australia.

Eastlake (ēst'lāk), Sir Charles Lock, an English painter, president of the Royal Academy, born at Plymouth in 1793; died in 1865. He studied at the Royal Academy, London, and at Paris. In 1817 he visited Italy and Greece, and painted his *Pilgrims arriving in sight of Rome* and other pictures. In 1830 he was elected member of the Royal Academy, and in 1850 became its president, receiving at the same time the honor of knighthood. In 1843-47 he was keeper of the National Gallery, of which he was latterly director for about ten years. He also became known as a writer on art by his *Materials for a History of Oil-painting.*

East Liverpool, a city of Columbiana Co., Ohio, 44 miles W. N. W. of Pittsburgh, on the Ohio River. It has extensive porcelain, earthenware, terra-cotta and flint works. Pop. 20,387.

East London, a seaport of Cape Colony, on the S. E. coast, at the mouth of Buffalo River. It is the third port for export trade in the colony. Pop. about 13,000.

Easton, a city, capital of Northampton Co., Pennsylvania, on the Delaware River, at the mouth of the Lehigh, 50 miles N. of Philadelphia; served by eight railroads. Here is Lafayette College, founded in 1826. The city is near the great cement belt, and near the slate-quarry and coal and iron fields. It has manufactures of quarry and mine drills, pumps, pneumatic tools, stoves, ranges, cast iron pipe, agricultural implements, machinery, etc.; also glass furnaces, oil refineries, machine shops, etc. It is at the junction of the Delaware, Lehigh and Morris canals. Pop. 32,000.

Easton, a village and township (town) of Bristol Co., Massachusetts, 25 miles S. of Boston. It produces shovels, lace-making machinery, iron castings, automobiles, etc. Pop. of town, 5139.

East Orange, a city of Essex Co., New Jersey, adjoining Newark. It has manufactures of dynamos, electrical appliances, etc., and contains the residences of many business men of New York. Pop. 41,000.

East Pittsburgh, a borough of Allegheny Co., Pennsylvania. It has large electric and other industrial plants, employing 18,000 men. Pop. 5615.

Eastport, a seaport of Maine, on Moose Island, in Passamaquoddy Bay. The tide here rises about 25 feet, and prevents the harbor from being obstructed with ice. The city is a fishing port and is the center of the sardine canning industry in the United States. It has various manufactures. Fort Sullivan defends the harbor. Pop. 4961.

East Providence, a township of Providence Co., Rhode Island, separated from Providence by the Seekonk River. It has chemical, electrical and wire works. Pop. 15,808.

East River, a strait in the S. E. corner of New York, separating Manhattan Island from Long Island, and dividing the two principal sections of New York city. It connects Long Island Sound with New York Bay and is crossed by a number of great suspension bridges, while railroad and trolley car tunnels run beneath its waters. It is about 10 miles long and ½ mile wide at its narrowest part, and contains Blackwell's, Ward's and Randall's islands.

East St. Louis, a city of St. Clair Co., Illinois, opposite St. Louis, Missouri, with which it is connected by two large bridges. It is a terminus of 27 railroads, and contains stockyards among the largest in the United States, and extensive packing houses. Its mule market is the leading one in the country. Important products are alfalfa, stock feed, baking powder, and roofing paper. There are many coal mines in the vicinity and hydro-electric power is furnished by the Keokuk plant. Pop. 80,000.

Eau (ō), a French word signifying *water*, and used in English with some other words for several spirituous water, particularly perfumes, as *eau de Cologne*, *eau de Luce*, etc.—*Eau de Cologne* is a fragrant water, made originally and in most perfection in Cologne by a manufacturer named Farina,

by whose successors the only genuine water is said still to be manufactured. It consists of spirits of wine flavored by different essential oils blended so as to yield a fine, fragrant scent.—*Eau Créole*, a highly esteemed liqueur made in Martinique by distilling the flowers of the mammee apple with spirit of wine.—*Eau de Luce* ('water of Luce'), so called from the name of its inventor, is made by dissolving white soap in spirit of wine, and adding oil of amber and sal ammoniac. It is a milky fluid, antispasmodic and stimulant.—*Eau de Vie* ('water of life'), a term used by the French for the coarser kinds of brandy, *cognac* being the name of the best.

Eau Claire (ō klār), a city of Wisconsin, capital of a county of the same name, at the junction of the Eau Claire and Chippewa rivers at the head of navigation. Several railroads center here, and its lumber business is very large and important. Its other industries are varied. Pop. 18,310.

Eaux-bonnes (ō-bon), a watering place of France, department Basses Pyrénées, about 25 miles south of Pau. The hot sulphur springs are said to have great efficacy in affections of the chest. Pop. (1906) 610. Near it is *Eaux Chaudes*, also with warm springs.

Eavesdropper (ēvs-drop'er), one who stands under the eaves or near the window or door of a house to listen and hear what is said within doors. In English law an eavesdropper is considered as a common nuisance and is punishable by fine.

Ebal (ē'bal), a mountain of Western Palestine, about half-way between Jerusalem and Nazareth, on the north side of a narrow valley, on the south side of which and directly opposite stands Mt. Gerizim with Nablous almost between. Here the Israelites set up an altar on their entrance into the Holy Land and had the law solemnly read to them by Joshua (Josh., viii, 30-35). At the east end of the valley are Jacob's well and Joseph's tomb.

Ebb. See *Tide*.

Ebbsfleet (ebs'flēt), a hamlet in the Isle of Thanet, County Kent, memorable as the place where the first Anglo-Saxon invaders landed.

Ebbw-vale (eb-bŏ'vāl), a town of England, in Monmouthshire, with ironworks, steelworks and collieries. Pop. (1911) 30,559.

Ebelians (e-bē'li-ans), a German religious sect originating at Königsberg in 1836, under the leadership of Archdeacon Ebel. They professed what they called spiritual marriage. In 1839 their leaders were condemned for unsound doctrine and impure lives.

Ebenaceæ (e-be-nā'se-ē), a natural order of exogenous plants, consisting of trees and shrubs, of which the wood is very hard, and frequently of very dark color in the center, as ebony. The leaves are alternate, and generally coriaceous and shining; calyx monosepalous and persistent, with three or six equal divisions; corolla monopetalous, with imbricated divisions. The fruit is a globular berry containing a small number of compressed seeds. The principal genus is *Diospyros*, which yields ebony and ironwood. See *Ebony*.

Ebers (ā'bĕrz), Georg Moritz, a German Egyptologist and novelist, born in 1837 at Berlin; studied at Göttingen, and afterwards at Berlin, where he devoted himself to Egyptology. In 1870 he was made professor at the University of Leipzig. He made more than one visit to Egypt. His most important works have been translated into English, such as *Egypt, Descriptive, Historical and Picturesque*, and the novels, *An Egyptian Princess, Uarda, Homo Sum, The Emperor, The Sisters*, all dealing with old Egyptian life; *The Burgomaster's Wife, Only a Word*, etc. Died in 1898.

Ebionites (eb'i-on-īts), a sect of the first century, so called from their leader, Ebion. They held several dogmas in common with the Nazarenes, united the ceremonies of the Mosaic institution with the precepts of the gospel, and observed both the Jewish Sabbath and Christian Sunday. They denied the divinity of Christ and rejected parts of the New Testament.

Eblis (eb'lis), in Mohammedan mythology, the chief of the evil spirits.

Eboli (eb'ō-lē), a town of Southern Italy, province of Salerno. Here is an old castle, commanding a splendid view. Pop. of town 9642; of commune 12,423.

Ebonite (eb'on-īt). See *Vulcanite*.

Ebony (eb'un-i), the popular name of various plants of different genera, agreeing in having wood of a dark color. The best-known ebony is derived from plants of the genus *Diospyros*, nat. order Ebenaceæ. The most valuable is the heart-wood of *D. Ebĕnus*, which grows in great abundance in the flat parts of Ceylon, and is of such size that logs of its heart-wood 2 feet in

diameter and from 10 to 15 feet long are easily procured. Other varieties of valuable ebony are obtained from *D. Ebenaster* of the East Indies and *D. melanoxylon* of Coromandel. Ebony is hard, heavy and durable, and admits of a fine polish or gloss. The most usual color is black, red, or green. The best is jet black, free from veins, very heavy, astringent, and of an acrid, pungent taste. On burning coals it yields an agreeable perfume, and when green it readily takes fire from its abundance of fat. It is wrought into toys, and used for mosaic and inlaid work.

Ebony (*Diospyros Ebenus*).

Ebro (ē'brō; Latin, *Ibĕrus*), a river in Spain, which has its source in the province of Santander, about 25 miles S. of the Bay of Biscay, and after a southeasterly course of about 500 miles enters the Mediterranean. Its navigation is much interrupted by rapids and shoals, to avoid which a canal about 100 miles long has been constructed nearly parallel to its course.

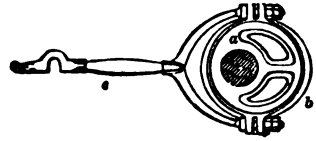
Ebullition (ē'bul-ish'un), the boiling of a fluid. See *Boil.*

Ecarté (ā-kär'tā), a game at cards for two persons, played with thirty-two cards, the small cards from two to six being excluded. In the English mode of playing the game the players cut for the deal, which is decided by the lowest card. The dealer gives five cards to either player, three and two at a time, and turns up the eleventh card for trump. If he turns up a king he scores one, and if a king occurs in the hand of either player he may score one by announcing it before the first trick. The cards rank as follows: king (highest), queen, knave, ace, ten, etc. The non-dealer leads; trumps take all other suits, but the players must follow suit if they can. Three tricks count one point, five tricks, two points; five points make game. Before play begins the non-dealer may claim to discard (*écarter*) any of the cards in his hand, and have them replaced with fresh ones from the pack. This claim the dealer may or may not allow. Should he allow he can discard as many as he pleases. Sometimes only one discard is allowed, sometimes more.

Ecbatana (ek-bat'a-na), the chief city or ancient metropolis of Media, the summer residence of the Median and Persian and afterwards of the Parthian kings. It was a place of great splendor at an early period. Its site can no longer be fixed with certainty, though many explorers agree in identifying it with the modern Hamadan.

Ecce Homo (ek'sē hō'mō; Latin, 'Behold the man!'), a name often given to crucifixes and pictures which represent Christ bound and crowned with thorns.

Eccentric (ek-sen'trik), a term in mechanics applied to contrivances for converting circular into reciprocating (backwards and forwards) rectilinear motion, consisting of variously shaped discs attached to a revolving shaft not in their center. An *eccentric wheel* is a wheel fixed on an axis that does not pass through the center. Its action is that of a crank of the same length as the eccentricity.



Eccentric of Steam Engine.
a, Eccentric wheel; *b*, eccentric strap; *c*, eccentric rod.

Ecchymosis (ek-ki-mō'sis) is the medical term applied to the extravasation of blood beneath the skin, or in the tissues of the body, whether resulting from a bruise or any other cause.

Eccles (ek'ls), a town of England, in Lancashire, 4 miles from Manchester, of which it may be considered a suburb. Pop. (1911) 41,946.

Ecclesiastes (e-klē-si-as'tēz), the title by which the Septuagint translators rendered the Hebrew *Coheleth* ('the gatherer of the people'), a symbolic name explained by the design of the book and the dramatic position occupied by Solomon in it, one of the canonical books of the Old Testament. According to Jewish tradition, it was written by Solomon; but the best modern criticism has decided that its style and language, no less than its thought, belong to a much later writer.

Ecclesiastical Courts, courts in which the canon law is administered and in which ecclesiastical causes are determined. In England they are the *Archdeacon's Court, the Consistory Courts, the Court of Arches, the Court of Peculiars, the Prerogative Courts of the two arch-*

bishops, the Faculty Court, and *the Privy-council*, which is the court of appeal, though its jurisdiction may by order in council be transferred to the new Court of Appeal. In Scotland the ecclesiastical courts are the *Kirk-session, Presbytery, Synod, General Assembly* (which is the supreme tribunal as regards doctrine and discipline), and the *Teind Court*, consisting of the judges of the Court of Session, which has jurisdiction in all matters affecting the teinds of a parish.

Ecclesiasticus (e-klē-si-as'ti-kus), the title of a book placed by Protestants and Jews among the apocryphal writings. The author calls himself Jesus the son of Sirach. Originally composed in Aramaic, the book was translated into Greek by the grandson of the original author about the third century B.C.

Ecclesiology (e-k l e-s i-o l' ō-ji), the science or branch of knowledge which deals with ecclesiastical antiquities, such as buildings, rites, vestments, etc.

Echalot (esh'a-lot). See *Shallot.*

Echelles, Les (lā-zā-shel; 'the Ladders'), a village of France, dep. Savoie, 12 miles southwest of Chambéry, in a valley from which egress at one end was formerly by means of ladders, but is now by a tunnel. Pop. 798.

Echelon (esh'e-lon), the position of an army when its different positions are somewhat in the form of steps, or with one division more advanced than another, being parallel and none of them in line.

Echeneis (ek-e-nē'is), a genus of fishes, family Scomberidæ or mackerels, having a disc on the head by which the fish can attach itself firmly to a solid object. *E. Remŏra* is abundant in the Mediterranean. See *Remora.*

Echeveria (ech-e-vē'ri-a), a genus of succulent plants, order Crassulaceæ (house-leek), chiefly natives of Mexico, but now cultivated in European and other gardens and greenhouses, some for their flowers, others for their foliage.

Echidna (e-kid'na), a genus of Australian monotrematous, toothless mammals, in size and general appearance resembling a large hedgehog, excepting that the spines are longer, and the muzzle is protracted and slender, with a small aperture at the extremity for the protraction of a long flexible tongue. The habits of the echidna are nocturnal; it burrows, having short strong legs with five toes, and feeds on insects, which it catches by protruding its long, sticky tongue. It is nearly allied to the Ornithorhynchus, the two forming a peculiar class of animals, having in their structure some peculiarities at once of mammals, birds and reptiles. In 1884 it was found that, as Geoffroy St. Hilaire had suspected, the echidna and ornithorhynchus, although essentially mammals, were yet oviparous, producing their young from eggs. One species (*E. hystrix*), from its appearance, is popularly known as the *porcupine ant-eater.*

Echimys (ek'i-mis), a genus of South American rodent quadrupeds corresponding in some of their characters with dormice, but having the tail scaly and the fur coarse and mingled with flattened spines.

Echinite (e-k ī' n ī t), a fossil sea-urchin.

Echinocactus (e-k ī-n ō-kak'tus), a genus of cactaceous plants inhabiting Mexico and South America, and remarkable for their peculiar forms, being globular, oblong, or cylindrical, and without leaves, fluted and ribbed, with stiff spines clustered on woolly cushions. Some of them are very bulky. The flowers are large and showy. See *Cactus.*

Echinococcus (e-kī-nō-kok'us), one of the larval forms (*scolicēs*) of the tapeworm of the dog (*Tœnia Echinococcus*), which may occur in man and cause serious disease.

Echinodermata (e-kī-nō-dėr'ma-ta), a class or subkingdom of invertebrate animals characterized by having a tough integument in which lime is deposited in granules (as in the starfish and sea-cucumber), or so as to form a rigid test or shell like that of the sea-urchin; and by the radial arrangement of many of the parts of the adult, though this is not necessarily carried out in the digestive and reproductive systems. They are provided with an apparatus for water circulation opening into the *ambulacra* or tubular feet, which are put into use by being distended with fluid. Some of them, as the encrinites or sea-lilies, are permanently fixed by a stalk when adult. Their development is accompanied with metamorphosis, and the embryo shows a distinctly bilateral aspect, though the radiate arrangement prevails in the adult. By some they are classed with the Scolecida in the subkingdom Annuloida. The sexes are distinct. The class is divided into seven orders: the Echinoidea (sea-urchins), Asteroidea (starfishes), Ophiuroidea

(sand-stars and brittle-stars), Crinoidea (feather-stars, encrinites, etc.), Cystidea (extinct), Blastoidea (extinct), and Holothuroidea (sea-cucumbers). All are marine.

Echinus (e-kī'nus), SEA-URCHIN, or SEA-EGG, a genus of marine animals, the type of an order (Echinoidea) of the class Echinodermata (see above). The body is more or less globular and covered with a test or shell, often beset with movable spines. Locomotion is effected by a singular system of ambulacra or 'tube-feet,' which are distended with water, protruded through pores, and again retracted. The mouth is situated on the inferior surface, generally in the center, is armed with calcareous teeth, and opens into a gullet conducting to a distinct stomach. The stomach has issue into a convoluted intestine which winds round the interior of the shell and terminates in a distinct anus. The anus varies in position, being sometimes on the apical disc and sometimes marginal. The *E. esculentus* and some other species are edible.

Echinus (e-kī'nus), in architecture, the *ovolo* or quarter-round convex molding, seen in capitals of the Doric order. It is especially frequently found carved with the egg-and-dart ornament.

Echo (ek'ō), the repetition of a sound caused by the reflection of sound-waves at some moderately even surface, as the wall of a building. The waves of sound on meeting the surface are turned back in their course according to the same laws that hold for reflection of light. In order that the echo may return to the place from which the sound proceeds, the reflection must be direct, and not at an angle to the line of transmission, otherwise the echo may be heard by others, but not by the transmitter of the sound. This may be effected either by a reflecting surface at right angles to the line of transmission or by several reflecting surfaces which end in bringing the sound back to the point of issue. Sound travels about 1125 feet in a second; consequently, an observer standing at half that distance from the reflecting object would hear the echo a second later than the sound. Such an echo would repeat as many words and syllables as could be heard in a second. As the distance decreases the echo repeats fewer syllables till it becomes monosyllabic. The most practiced ear cannot distinguish in a second more than from nine to twelve successive sounds, so that a distance of not less than 60 feet is needed to enable a common ear to distinguish between the echo and the original sounds. At a near distance the echo only clouds the original sounds, and this often interferes with the hearing in churches and other large buildings. Woods, rocks and mountains produce natural echoes in every variety, for which particular localities have become famous.—In Greek mythology Echo was a nymph (one of the Oreads) who fell in love with Narcissus, and because he did not reciprocate her affection she pined away until nothing was left but her voice.

Echuca (e-chō'ka), an Australian town, colony of Victoria, on the Murray, over which is an iron railway and roadway bridge, connecting it with Moama in New South Wales; trade (partly by the river) in timber, wool, etc. Pop. 4789.

Ecija (ā'thē-*h*ä), an ancient town of Southern Spain, province of Seville, on the Genil, with manufactures of textile fabrics and a good trade. It is one of the hottest places in Spain. Pop. 24,372.

Eck (ek), JOHANN MAYR VON, the celebrated opponent of Luther, born in 1486. Having obtained a reputation for learning and skill in disputation he was made doctor of theology, canon in Eichstädt, and pro-chancellor of the University of Ingolstadt. He went to Rome in 1520 and returned with a papal bull against Luther, in attempting to publish which he met with violent popular opposition. In 1530, while at the diet of Augsburg, he made the remarkable admission that he could confute the Augsburg Confession by the fathers but not by the Scriptures. Eck was present also at the diets of Worms (1540) and Ratisbon (1541). He died in 1543.

Eckermann (e k' ĕ r-m ä n), JOHANN PETER, a German writer, born in 1792. In 1813 he served in the army against the French, and was afterwards appointed to a small governmental post. He finally settled in Weimar, where he became private secretary to Goethe. After Goethe's death he published his conversations with Goethe. He died in 1854.

Eckert (ek'ert), THOMAS THOMPSON, telegraphist, born at St. Clairsville, Ohio, in 1825. He became a telegraph superintendent in 1852; was subsequently put in charge of the military telegraph of the army of the Potomac, and later of the whole army, developing a system which was ultimately extended over the whole country. He

was assistant secretary of war in 1864-66, and successively president of the Atlantic and Pacific, American Union and Western Union telegraph companies, obtaining the latter position in 1892. He still holds this position and is chairman of the board of directors of the Western Union and its associated companies. Died 1910.

Eclectic (ek-lek'tik), or NEW SCHOOL OF MEDICINE, as distinguished from the 'regulars,' originated about 1825 in New York. It rejects mercury and most other minerals in medicine, practicing simple hygienic treatment, and adding largely to the list of vegetable medicines. The school numbers over 15,000 physicians in the United States.

Eclectics (Greek, *eklektikos*, select) is a name given to all those philosophers who do not follow one system entirely, but select what they think the best parts of all systems. In this century the eclectic method found a notable supporter in the French philosopher Victor Cousin.

Eckhart (ek'hart), MEISTER, one of the profoundest speculative thinkers, among the German mystics. Little is known of his personal history, except that he was born in Strasburg or Saxony in the latter part of the thirteenth century, became a Dominican monk, was appointed vicar general of Bohemia in 1307, held some other pastoral positions and died in 1327. He speculated deeply on the subject of *Being*, the personality of the Deity, etc., his extant writings being sermons and tracts in Latin and German.

Eclipse (e-klips'; Greek *ekleipsis*, a failing, *ekleipō*, to fail), an interception or obscuration of the light of the sun, moon, or other heavenly body by the intervention of another and non-luminous heavenly body. Stars and planets may suffer eclipse, but the principal eclipses are those of the sun and the moon.

An Eclipse of the Moon is an obscuration of the light of the moon occasioned by the interposition of the earth between the sun and the moon; consequently all eclipses of the moon happen at full moon; for it is only when the moon is

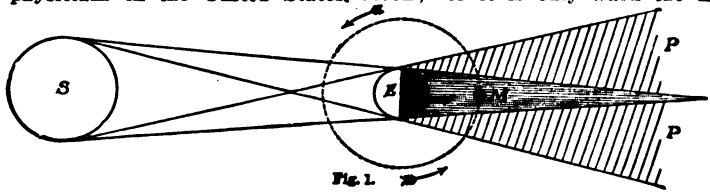


Fig. 1.

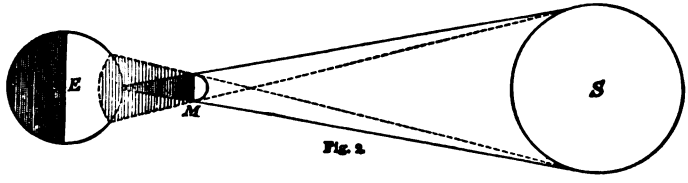


Fig. 2.

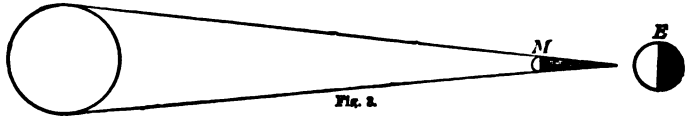


Fig. 3.

Diagrams Illustrating the Theory of Eclipses.

on that side of the earth which is turned away from the sun, and directly opposite, that it can come within the earth's shadow. Further, the moon must at that time be in the same plane as the earth's shadow; that is, the plane of the ecliptic in which the latter always moves. But as the moon's orbit makes an angle of more than 5° with the plane of the ecliptic, it frequently happens that though the moon is in opposition it does not come within the shadow of the earth. The theory of lunar eclipses will be understood from Fig. 1, where S represents the sun, E the earth, and M the moon. If the sun were a point of light there would be a sharply outlined shadow or *umbra* only, but since the luminous surface is so large there is always a region

in which the light of the sun is only partially cut off by the earth, which region is known as the *penumbra* (P P). Hence during a lunar eclipse the moon first enters the penumbra, then is totally eclipsed by the umbra, then emerges through the penumbra again.

An Eclipse of the Sun is an occultation of the whole or part of the face of the sun occasioned by an interposition of the moon between the earth and the sun; thus all eclipses of the sun happen at the time of new moon. Fig. 2 is a diagram showing the principle of a solar eclipse. The dark or central part of the moon's shadow, where the sun's rays are wholly intercepted, is here the *umbra*, and the light part, where only a part of them are intercepted, is the *penumbra;* and it is evident that if a spectator be situated on that part of the earth where the umbra falls there will be a total eclipse of the sun at that place; in the penumbra there will be a partial eclipse, and beyond the penumbra there will be no eclipse. As the earth is not always at the same distance from the moon, and as the moon is a comparatively small body, if an eclipse should happen when the earth is so far from the moon that the moon's shadow falls short of the earth, a spectator situated on the earth in a direct line between the centers of the sun and moon, would see a ring of light round the dark body of the moon; such an eclipse is called *annular*, as shown in Fig. 3; when this happens there can be no total eclipse anywhere, because the moon's umbra does not reach the earth. An eclipse of the sun begins on the western side of his disc and ends on the eastern; and an eclipse of the moon begins on the eastern side of her disc and ends on the western. The average number of eclipses in a year is four, two of the sun and two of the moon; and as the sun and moon are as long below the horizon as above it, the average number of visible eclipses in a year is two.

The total eclipse of the sun on June 8, 1918, was a return of the one of May 28, 1900, crossing the whole country diagonally from the Pacific Coast to the Atlantic Coast of Florida, and varying in width of totality from 66 miles in the former to 40 in the latter.

Ecliptic (e-klip'tik), the sun's path, the great circle of the celestial sphere, in which the sun appears to describe his annual course from west to east—really corresponding to the path which the earth describes. (See *Earth.*) The Greeks observed that eclipses of the sun and moon took place near this circle; whence they called it the *ecliptic.* The ecliptic has been divided into twelve equal parts, each of which contains 30 degrees, and which are occupied by the twelve celestial signs or constellations, viz.:

Aries (the Ram), March 20.
Taurus (the Bull), April 20.
Gemini (the Twins), May 21.
Cancer (the Crab), June 21.
Leo (the Lion), June 22.
Virgo (the Virgin), August 23.
Libra (the Balance), Sept. 23.
Scorpio (the Scorpion), Oct. 23.
Sagittarius (the Archer), Nov. 22.
Capricornus (the Goat), Dec. 21.
Aquarius (the Water-carrier), Jan. 19.
Pisces (the Fishes), Feb. 18.

These are also called signs of the *zodiac*, the zodiac being a belt of the heavens extending 9 degrees on each side of the ecliptic. The days of the month annexed show when the sun, in its annual revolution, enters each of the signs of the zodiac. From the first point of Aries, or the place of the sun at the vernal equinox, the degrees of the ecliptic are counted from west to east. The plane of the ecliptic is that by which the position of the planets and the latitude and longitude of the stars are reckoned. The points at which the equator and ecliptic intersect are subject to a continual variation, receding westward at the rate of about 50 seconds a year. The angle at which the ecliptic stands to the equator is also variable, and has been diminishing for about 4000 years at the rate of about 50 seconds in a century. Laplace showed, however, that this variation has certain fixed limits, and that after a certain time the angle will begin to increase again. The combined result of these two changes is to cause the pole of the earth not to point constantly to the same spot in the heavens, but to describe an undulating circle around a certain point; but this movement is so slow that it takes many thousand years to complete it. See *Nutation* and *Precession.*

Eclogue (ek'log), a term usually applied to what Theocritus called *idyls*—short, highly finished poems, principally of a descriptive or pastoral kind. See *Idyl.*

Ecole des Beaux Arts ('School of Fine Arts'), the French government school of fine arts at Paris, founded by Mazarin in 1648, and provided with an extensive staff of teachers. The competitions for the *grands prix de Rome* take place at

this school. All artists between the ages of fifteen and twenty-five, whether pupils of this school or not, may compete, after passing two preliminary examinations. The successful competitors receive an annual allowance from the state for three or four years, two of which must be passed at Rome.

Ecole Normale Supérieure ('Superior Normal School'), a school at Paris for the training of those teachers who have the charge of the secondary education in France, founded by decree of the Convention in 1794, reorganized by Napoleon in 1808, and again in 1830 by the government of Louis Philippe. It maintains a hundred students and has a course of three years' duration.

Ecole Polytechnique ('Polytechnic School'), a school in Paris established with the purpose of giving instruction in matters connected with the various branches of the public service, such as mines, roads and bridges, engineering, the army and the navy, government manufactures, etc. It was founded in 1794, and is under the direction of the minister of war.

Ecology (ē-kol'ŏ-ji), in biology, the study of the laws of animal and vegetable activities, as manifested in their modes of life. It includes also the study of conditions of existence, such as the action on plants and animals of climate, soil, light, gravity, heat, etc.

Ecraseur (ā'krâ-zeur), in surgery, an instrument that consisted of a fine chain which was placed round the base of a growth or a tumor and gradually tightened by a screw till it passed through the structure. It was used in cases of cancer of the tongue, polypi, etc.

Ectozoa (ek'to-zō-a), a term which has been introduced, in contradistinction to Entozoa, to designate those parasites, as lice, ticks, etc., which infest the external parts of other animals.

Ecuador (ek-wâ-dōr'), a republic of South America, situated under the equator, whence it takes its name, between Peru and Colombia. It is of triangular shape, its base resting mainly on the Pacific, between lat. 1° 20′ N. and 4° 50′ S., its apex extending to about 73° 30′ w. lon.; area, about 116,000 square miles, or including the Galapagos Islands, 118,400 square miles. The country is divided into a number of provinces, and falls, as regards the surface, into three sections: the comparatively narrow and low-lying coast regions, the mountain region, and the extensive plains on the east. The mountain region is formed by a double range of snow-clad mountains—several of them active volcanoes—which enclose a longitudinal valley or tableland, with a breadth of 20 to 40 miles, and varying in elevation from 8500 to 13,900 feet. The most elevated of these mountains are, in the western range, Chimborazo, Pichincha, and Cotacachi, Chimborazo being 20,703 feet high. In the eastern range are Cayambe, Antisana and Cotopaxi (19,500). The cultivated land and the population of Ecuador lie chiefly in this elevated region, which extends along between the summits of the Cordillera, and may be considered as divided by transverse ridges or dikes into the valleys of Quito, Hambato and Cuenca. The chief towns here are Quito, the capital, with a pop. of 80,000; Riobamba and Cuenca, all situated at a height of 9000 feet or more above the sea. The chief ports of Ecuador are Guayaquil and Esmeraldas. The most considerable rivers, the Tigre, Napo, Pastaza, etc., belong to the basin of the Amazon; and some of them, notably the Napo, are navigable for long distances. On the western slope of the Andes the chief rivers are the Esmeraldas and the Guayaquil. Ecuador is comparatively poor in mammalia, although various kinds of deer as well as tapirs and peccaries are found in the forests. Parrots and humming-birds are also numerous, but perhaps the most remarkable of the birds in Ecuador is the condor, which dwells on the slopes of the Andes. Reptiles, including serpents, are numerous. The forests yield cinchona bark, caoutchouc, sarsaparilla, vegetable ivory, etc. The climate on the plains both in the east and the west, is moist, hot and unhealthy. In the higher regions the climate is rough and cold, but in great part the elevated valleys, as that of Quito, enjoy a delightful climate. Here the chief productions are potatoes, barley, wheat and European fruits. In the lower regions are grown all the food products of tropical climates, cacao, coffee, sugar, etc. The foreign commerce is not large, the exports and imports being annually about $7,500,000 each. Cacao forms three-fourths (or more) of the whole export; the remainder is made up of coffee, hides, vegetable ivory, caoutchouc, etc. The mining and manufactures of Ecuador are insignificant. The people are poorly educated. The religion is exclusively Roman Catholic. The executive government is vested in a president elected for four years, who is assisted by a council of state. The congress is the legislative body, and consists

of two houses, one formed of senators, two for each province, the other of deputies, one for every 30,000 inhabitants, both elected by universal suffrage. The congress has extensive privileges, and cannot be dissolved by the president. The seat of government is at Quito. In recent years the revenue and expenditure have been about $10,000,000 each. The total debt amounts to about $20,000,000. The money unit is the *sucre*, equivalent to a 5-franc piece, but the coins of the United States, France and Britain circulate. Railways and telegraphs have made very little progress.—Ecuador, at the time of the conquest of Peru by the Spaniards, formed part of the great empire of the Incas. It was erected first into a vice-royalty of Peru, then (from 1564 to 1718) into an independent presidency. From 1718 it became part of the presidency of New Granada. In the revolutionary war against Spain, Equador, along with the neighboring territories, secured its independence in 1822, and was ultimately erected into a separate republic in 1831. Of the present population, the aboriginal red race form more than half; the rest are negroes, mulattoes, mestizoes, a degenerate breed of mixed negro and Indian blood, and Spanish Creoles or whites. In 1917, during European war, Ecuador broke off diplomatic relations with Germany. Pop. est. 1,500,000.

Ecumenical Council (e-kū-men'i-kal), a general ecclesiastical council regarded as representing the whole Roman Catholic Church. The last was held at Rome in 1870. There were present 803 delegates, including cardinals, archbishops, bishops, abbots and generals of orders. After much discussion and the withdrawal of a few bishops, who afterwards submitted, the infallibility of the pope as head of the church was decreed.

Eczema (ek'ze-ma), a disease of the skin, marked by an eruption of small vesicles, preceded by redness, heat and itching of the part. In course of time the minute vesicles burst, and discharge a thin, acrid fluid, which often gives rise to excoriation. The most severe form of this disease arises from constitutional diseases, but purely local attacks are likewise caused by exposure of the skin to irritating substances.

Edam (ā-dăm'), a town of North Holland, near the Zuider Zee, 12 miles N. N. E. of Amsterdam. This place is chiefly noted for its trade in cheese and wood. Pop. 6444.

Edda (ed'a; meaning poetry, poetics), the name given to two ancient Icelandic works, the one consisting of mythological poems, the other being mainly in prose. The first of these collections, called the *Older* or *Poetic Edda*, was compiled in the thirteenth century. For a long time an earlier date was given, the compiler being erroneously believed to have been Sæmund Sigfusson, a learned Icelandic clergyman, who lived from about 1056 to 1133. It consists of thirty-three pieces, written in alliterative verse, and comprising epic tales of the Scandinavian gods and goddesses, and narratives dealing with the Scandinavian heroes. These poems are now assigned to a period extending from the ninth to the eleventh century. The prose *Edda*, or *Younger Edda*, presents a kind of prose synopsis of the Northern mythology; a treatise on the Scaldic poetry and versification, with rules and examples; and lastly a poem (with a commentary) in honor of Haco of Norway (died in 1263). In its earliest form this collection is ascribed to Snorri Sturluson, who was born in Iceland in 1178, and was assassinated there in 1241 on his return from Norway, where he had been scald or court poet.

Eddy, Mary Baker, founder of Christian Science, born at Bow, near Concord, N. H., July 16, 1821. Her textbook, *Science and Health with Key to the Scriptures*, was first published at Boston in 1875. Based on the Bible, it purports to be a complete statement of Christian Science, including directions for its practice. Other books by Mrs. Eddy are *People's Idea of God, Christian Healing, Retrospection and Introspection, Unity of Good, Rudimental Divine Science, No and Yes, Church Manual, Miscellaneous Writings, Christ and Christmas, Christian Science versus Pantheism, Pulpit and Press, Messages to the Mother Church, Poems, The First Church of Christ Scientist*, and *Miscellany*. She founded the Church of Christ, Scientist, in 1879, and the Massachusetts Metaphysical College in 1881—both at Boston; and established the Christian Science Journal (monthly) and the Christian Science Monitor (daily). She died at Newton, Mass., December 3, 1910. See also *Christian Science*.

Eddystone Lighthouse (ed-i-stōn), a lighthouse in the English Channel, erected to mark a group of rocks lying in the fairway from the Start to the Lizard. The first lighthouse, of wood, built in 1696, was carried away in the storm of 1703. Another was burned in 1755. It was succeeded, 1757–59, by one with

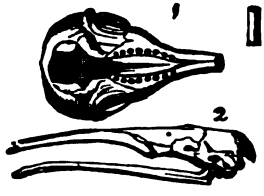
a circular tower 85 feet high; but as the foundations on which it stood became much weakened, a new structure, designed by Sir J. N. Douglass, was built in 1879-82 on the neighboring reef. Its light is visible 17½ miles.

Edelweiss (ā'dėl-vīs; Ger. 'noble white'), *Gnaphalium Leontopodium* (or *Leontopodium Alpinum*), a composite plant inhabiting the Alps, and often growing in the most inaccessible places. Its flower-heads are surrounded by a spreading, foliaceous, woolly involucre, and its foliage is also of the same woolly character. It is not difficult to cultivate, but is apt to lose its peculiar woolly appearance.

Eden (ē'den), the original residence of the first human pair. It is said to have had a garden in the eastern part of it, and we are told that a river went out of Eden to water this garden, and from thence it was parted into four heads, which were called respectively Pison, Gihon, Hiddekel and Euphrates (Phrat), but this does not enable us to identify the locality. It was not the whole of Eden that was assigned to man for his first habitation, but the part towards the east, to which the translators of the Authorized Version have given the name of the Garden of Eden, and which Milton, in *Paradise Lost*, calls Paradise, that word (originally Persian) having in its Greek form (*paradeisos*) been applied to the Garden of Eden by the translators of the Septuagint.

Eden, a river in England, in Westmoreland and Cumberland, falling into the Solway Firth after a course of 65 miles.—Also, a river in Fifeshire, Scotland.

Edentata (ē-den-tā'ta), or TOOTHLESS ANIMALS, the name of an order of Mammalia, though only two genera of the order want teeth, the ant-eaters and the pangolins. The remainder are merely destitute of teeth in the front of the jaws. The teeth they possess, however, are destitute of enamel, do not have complete roots, and are not replaced by a second set. This order is also characterized by the presence of great claws surrounding the ends of the toes, and more or less approximating to the nature of hoofs. It is divided into two sections, the first comprehending the sloths, which subsist on vegetable food, and the gigantic fossil animals, the Megatherium and the Megalonyx; and the second including the armadillos and the ant-eaters, which live mainly on insects, though some of the armadillos eat other sorts of animal food and also vegetables.



1, Skull and (3) Tooth of *Chlamyphŏrus truncātus* (a small species of armadillo). 2, Skull of *Myrmecophăga jubāta* (Great Ant-eater).

Edessa (ē-des'sa), the name of two ancient cities.—1. The ancient capital of Macedonia, and the burial place of its kings, now *Vodhena*. It is probably the same with the still more ancient Aegæ.—2. An important city in the north of Mesopotamia, which, subsequent to the establishment of Christianity, became celebrated for its theological schools. In 1098, in the first Crusade, Edessa came into the hands of Baldwin, but ultimately became part of the Turkish Empire. It is thought to be the modern Urfah or Orfa.

Edfu (ed-foo; ancient, *Apollinopolis*), a village in Upper Egypt, on the left bank of the Nile, 54 miles S. S. E. of Luxor. It is now a poor place, but its ancient magnificence is attested by several remains, especially a temple, founded by Ptolemy Philopator (B.C. 181-145), the largest in Egypt after those of Karnak and Luxor.

Edgar (ed'gar; THE PEACEABLE), one of the most distinguished of the Saxon kings of England, was the son of King Edmund I. He succeeded to the throne in 959, and managed the civil and military affairs of his kingdom with great vigor and success. In ecclesiastical affairs he was guided by Dunstan, and was a great patron of the monks. He died in 975, and was succeeded by his son Edward the Martyr.

Edgar Atheling, grandson of Edmund Ironside and son of Edward the Outlaw, was born in Hungary, where his father had been conveyed in infancy to escape the designs of Canute. After the battle of Hastings, Edgar (who had been brought to England in 1057) was proclaimed king of England by the Saxons, but made peace with William and accepted the Earldom of Oxford. Having been engaged in some conspiracy against the king he was forced to seek refuge in Scotland, where his sister Margaret became the wife of Malcolm Canmore. Edgar subsequently

INTERIOR BAS RELIEF OF THE TEMPLE, EDFU

was reconciled with William and was allowed to live at Rouen, where a pension was assigned to him. Afterwards, with the sanction of William Rufus, he undertook an expedition to Scotland for the purpose of displacing the usurper Donald Bane, in favor of his nephew Edgar, son of Malcolm Canmore, and in this object he succeeded. He afterwards took part in Duke Robert's unsuccessful struggle with Henry I, but was allowed to spend his last years in England.

Edgehill (ej'hil), an eminence in Warwickshire, England, where was fought a bloody but indecisive battle, October 23, 1641, between the Royalists under Charles I and the forces of the Parliament under the Earl of Essex.

Edgeworth (ej'wurth), MARIA, authoress, was born at Hare Hatch, near Reading, Berkshire, in 1767; died in 1849. Her first novel, *Castle Rackrent*, a tale of Irish life, published in 1801, immediately established her reputation. This was followed by a long series of novels, moral tales, popular tales, etc. among which may be mentioned *Belinda*, *Leonora*, *Ennui*, *The Absentee*, *Helen*, etc. Deserving of mention also are Miss Edgeworth's collection of *Tales for Children* and the *Series of Early Lessons*.

Edgewater (ej'wą-ter), a former village of Staten Island, New York, on New York Bay, adjoining the village of Stapleton. It is now part of New York City. See *Richmond, Borough of*.

Ed'gren, ANNA CARLOTTA LEFFLER, a Swedish novelist and dramatist, born near Stockholm in 1849; died in 1892. She wrote at first under the name of 'Carlot'; but in 1882 began to issue under her own name a collection of novels entitled *Ur Lifret*. Edgren ranks among the best realistic novelists of Sweden.

Edhem Pasha, a Turkish soldier and statesman, was born at Scio in 1823; died in 1905. He was sold in boyhood as a slave and educated by his master in Paris. Returning to Turkey, he was made a captain in the army, and in time entering civil life, became successively minister of foreign affairs, ambassador to several European courts, and grand vizier. Returning to the army, he distinguished himself in the war with Russia and Greece.

Edict (ē'dikt), a public proclamation by a sovereign, a governor, or other competent official.

Edict of Nantes. See *Nantes*.

Edinburgh (ed'in-bur-o), the metropolis of Scotland, and one of the finest as well as most ancient cities in the British Empire, lies within 2 miles of the south shore of the Firth of Forth. It is picturesquely situated, being built on three eminences which run in a direction from east to west, and surrounded on all sides by lofty hills except on the north, where the ground slopes gently towards the Firth of Forth. The central ridge, which constituted the site of the ancient city, is terminated by the castle on the west, situated on a high rock, and by Holyrood House on the east, not far from which rise the lofty elevations of Salisbury Crags, Arthur's Seat (822 feet high), and the Calton Hill overlooking the city. The valley to the north, once the North Loch, but now drained and traversed by the North British Railway, leads to the New Town on the rising ground beyond, a splendid assemblage of streets, squares and gardens. The principal street of the Old Town is that which occupies the crest of the ridge on which the latter is built, and which bears at different points the names of Canongate, High Street, Lawnmarket and Castle Hill. This ancient and very remarkable street is upwards of one mile in length, rising gradually with a regular incline from a small plain at the east end of the town, on which stands the palace of Holyrood, and terminating in the huge rock on which the castle is built, 383 feet above sea-level. The houses are lofty and of antique appearance. Among the notable buildings are the ancient Parliament House, now the seat of the supreme courts of Scotland; St. Giles' Church or Cathedral, an imposing edifice in the later Gothic style, recently carefully restored; the Tron Church; Victoria Hall (where the General Assembly of the Established Church meets), with a fine spire; the Bank of Scotland, etc., besides some of the old family houses of the Scottish nobility and other buildings of antiquarian interest. From this main street descend laterally in regular rows numerous narrow lanes called *closes*, many of them extremely steep, and very few at their entrances more than 6 feet wide; those which are broader, and admit of the passage of carriages, are called *wynds*. In these and the adjacent streets the houses are frequently more than 120 feet in height, and divided into from six to ten stories, or *flats*, the communication between which is maintained by broad, stone stairs, winding from the lowest part of the building to the top. In the Old Town the most remarkable

public building is the castle. This fortress contains accommodation for 2000 soldiers, and the armory space for 30,000 stand of arms. In an apartment here is kept the ancient regalia of Scotland. The palace of Holyrood, or Holyrood House, as it is more generally called, stands, as already mentioned, at the lower or eastern extremity of the street leading to the castle. No part of the present palace is older than the time of James V (1528), while the greater portion of it dates only from the time of Charles II. In the northwest angle of the building are the apartments which were occupied by Queen Mary, nearly in the same state in which they were left by that unfortunate princess. Adjoining the palace are the ruins of the chapel belonging to the Abbey of Holyrood, founded in 1128 by David I. The Advocates' Library, the largest library in Scotland, contains upwards of 250,000 printed volumes and 2000 MSS.

Printing, coachbuilding, type founding, machine-making, furniture-making, ale-brewing and distilling are the principal industries. Edinburgh is the headquarters of the book trade in Scotland, and the seat of the chief government departments. The origin of Edinburgh is uncertain. Its name is thought to be derived from Eadwinsburgh, the Burgh of Edwin, a powerful Northumbrian king, who absorbed the Lothians in his rule. The town was made a royal burgh in the time of David I; but it was not till the fifteenth century that it became he recognized capital of Scotland. Population 355,366. The county of EDINBURGH or MIDLOTHIAN is bounded N. by the Firth of Forth, along which it extends 11 or 12 miles; area, 366 sq. miles, over half of which is arable or under permanent pasture. The S., S. E. and S. W. parts of the county are diversified with hills, of which the two principal ranges are the Pentlands and Moorfoots, the former stretching across the county to within 4 miles of Edinburgh. The principal rivers are the North and South Esks and the Water of Leith, all running into the Forth. The Lowlands towards the Forth are the most fertile; the farms are of considerable size, and the most approved methods of agriculture are in use. The hilly parts are chiefly under pasturage and dairy farming. The chief crops are oats, barley, turnips and potatoes. The manufactures of the county are comparatively limited, but include ale, whiskey, gunpowder, paper, tiles, etc. The fisheries on the Forth are valuable. The chief towns are: Edinburgh, capital of Scotland, Leith, Dalkeith, Musselburgh and Portobello. The county returns one member to the House of Commons. Pop. 355,366.

Edinburgh, DUKE OF, Prince Alfred Ernest Albert, Duke of Saxony and Prince of Saxe-Coburg-Gotha, the second son of Queen Victoria, was born at Windsor Castle in 1844. At the age of fourteen he joined the steam frigate *Euryalus* as naval cadet, and served on various foreign stations. In 1862 he declined the offer of the throne of Greece. On his majority he was created Duke of Edinburgh, Earl of Kent and Earl of Ulster, and in 1867 was appointed to the command of the frigate *Galatea*, in which he visited Australia and other countries. In 1874, he married the Grand-duchess Marie, only daughter of the Emperor of Russia. In August, 1893, he became reigning Duke of Saxe-Coburg-Gotha. Died July 31, 1900.

Edinburgh University, the latest of the Scottish universities, was founded in 1582 by a charter granted by James VI. Originally there were only four regents (or professors), besides a principal, but the number of chairs is now about forty, besides assistants. There are four faculties, viz., arts, divinity, law and medicine. Some of the professors are appointed by the crown, others are elected by the university court and by special electors, and a considerable number by the curators, who also elect the principal. The number of matriculated students has recently been about 3500 each winter, the greater number in medicine. The degrees of Bachelor of Divinity (B.D.) and Doctor of Divinity (D.D.) the latter honorary, are bestowed in the faculty of divinity. Degrees in science are also conferred. The present university buildings were begun in 1789. The library of the university contains about 170,000 printed volumes, besides 2000 manuscripts. There is also a separate theological library containing about 10,000 volumes. There are various bursaries, scholarships and fellowships, amounting annually to about £10,000.

Edison (ed'i-son), THOMAS ALVA, an American inventor, born at Milan, Erie Co., Ohio, in 1847, of a mother of Scotch and a father of Dutch extraction. He was poorly educated, but in some measure supplied the defect by assiduous reading. He became a newsboy on the Grand Trunk Railway, and afterwards, becoming possessed of some type, issued a small sheet of his own on the train. He then set himself to learn telegraph work, and in a short time became

an expert operator. In 1863, while at Indianapolis, he invented an automatic telegraph repeater. This was the first of a long series of improvements and inventions. He opened an extensive establishment at Newark for the manufacture of electrical, printing, automatic and other apparatus. In 1876 he gave up manufacturing and removed to Menlo Park, New Jersey. Here, as later at Llewllyn Park, Orange, he devoted himself to investigation. His inventions have been very numerous, among the most important of them being the quadruplex telegraph, the carbon telephone, the 'Edison' system of lighting, the electric fire-alarm, the phonograph, the kinetoscope and the photometer. His most recent invention of importance is an electric storage battery, small in size, but remarkable in power. He has received patents for more than 900 inventions.

Edmonton (ed'mun-tun), a town in England, county of Middlesex, 7½ miles north of London, with an extensive trade in timber, carried on by the Lea River navigation. The 'Bell at Edmunton' has become famous by association with the adventures of Cowper's John Gilpin. Pop. (1911) 64,820.

Edmonton, the county seat of Alberta, Canada, on Canadian Pacific, Grand Trunk Pacific and Canadian Northern railways; 35 miles south of the geographical center of the province on the North Saskatchewan River. Has coal mines and numerous industries. Contains the new Parliament buildings, the University of Alberta, and other institutions; also good schools and public parks. Pop. (1913) 67,243.

Edmund (ed'mund), ST., King of the East Angles, began to reign in 855; died in 870. He was revered by his subjects for his justice and piety. In 870 his kingdom was invaded, and he himself slain, by the Danes. The church made him a martyr, and a town (Bury St. Edmunds) grew up round the place of his sepulture.

Edmund I, King of England, an able and spirited prince, succeeded his brother Athelstan in 940. He conquered Cumbria, which he bestowed on Malcolm, king of Scotland, on condition of the latter doing homage for it. He was slain at a banquet, May 26, 946.

Edmund II, surnamed *Ironsiac*, King of England, was the eldest son of Ethelred II, and was born in 989. He was chosen king in 1016, Canute having been already elected king by another party. He won several victories over Canute, but was defeated at Assandun in Essex, and forced to surrender the midland and northern counties to Canute. He died after a reign of only seven months.

Edmunds, GEORGE FRANKLIN, statesman, born at Richmond, Vermont, in 1828. He studied law, became active and prominent in politics, and was elected United States Senator from Vermont in 1866. He was one of the leaders of the Republican party in that body, was president *pro tempore* of the Senate during Arthur's term as President, and resigned in 1891. He was the author of the anti-polygamy act of 1882 and the anti-trust law of 1890.

Edom (ē'dom), in the New Testament *Idumæa*, in ancient times a country lying to the south of Palestine. The Edomites are said in Genesis to be the descendants of Esau, who was also called Edom (a word signifying 'red'), and who dwelt in Mount Seir, the mountain range now called *Jebel Shera*, stretching between the Dead Sea and the Gulf of Akabah. The Edomites were subdued by King David, and after the separation of the ten tribes remained subject to the Kingdom of Judah until the reign of Jehoram, when they revolted and secured their independence for a time. They were again subdued about half a century later by Amaziah, and again, in the reign of Ahaz, recovered their independence, which they maintained till the time of the invasion of Judea by Nebuchadnezzar. They fell under the rule of the Persians, and later their fortunes were merged in those of Arabia. The chief city in this region was Petra, which now presents remarkable ruins, rock-cut temples, etc.

Edred (ed'red), King of England, son of Edward the Elder, succeeded to the throne on the murder of his brother, Edmund I, in May, 946. He quelled a rebellion of the Northumbrian Danes, and died in 955.

Edriophthalmata (e-dri-op-thal'ma-ta), one of the

EDRIOPHTHALMATA.

1. Fresh-water shrimp (*Gammarus pulex*). *a*, single eye.

2, Head of Cymothoa. *b*, Clusters of simple eyes.

great divisions of the Crustacea, including all those genera which have their eyes

sessile, or embedded in the head, and not fixed on a peduncle or stalk as in the crabs, lobsters, etc. It is divided into three orders, viz., *Læmodipoda*, *Amphipoda*, *Isopoda*, and includes slaters, sandhoppers, woodlice, etc. Some are parasitic on fishes, and of the others some live in the sea and some on land, as the common louse and the sea woodlouse.

Edrisi (ed-rē'sē), ABU-ABDALLAH MOHAMMED, a famous Arabian geographer, a descendant of the ancient princely family of the Edrisites, born about 1100 A.D.; died about 1180. He studied at the Moorish University of Cordova, after which he traveled through various countries. At the request of King Roger II of Sicily he constructed a globe with a map of the earth, which represented all the geographical knowledge of the age. He accompanied this with a descriptive treatise completed about 1150, and still extant.

Education (ed-ū-kā'shun; ultimately from L. *e*, out, and *duco*, to draw), in the widest sense, all that course of instruction and discipline which is intended to enlighten the understanding, correct the temper, cultivate the taste and form the manners and habits of youth, and fit them for usefulness in their future stations. Or it may be defined as the art or scientifically matured system of developing and cultivating the various physical, intellectual, æsthetic and moral faculties; and may thence be divided into four branches—physical, intellectual, æsthetic and moral education. Under physical education is included all that relates to the healthy development of the organs of sensation and the muscular and nervous system. Intellectual education comprehends the means by which the powers of the understanding are to be developed and improved, and the imparting of instruction in the various branches of knowledge. Æsthetic education comprehends the agencies which purify and refine the mind by training it to perceive and take delight in what is beautiful, true and pure in nature, literature and art. Moral education (in which may or may not be included religious education) embraces the various methods of cultivating and regulating the affections of the heart. In the popular view education is much the same as instruction, and is regarded as consisting simply in the lessons and discipline learned in connection with attendance at school. So far as governments or other public bodies have interested themselves in the education of youth this view is tolerably correct; but probably the most perfect system of education would be one in which schools formed no part whatever. Schools, however, seem to have been established at a very early period in the history of all civilized communities, though not necessarily in connection with any system of national education. Indeed, a thoroughly organized system of national education exists in but few states, Germany being the most conspicuous example of such. In England no national system existed till the passing of the Education Act of 1870, and in Britain it is only elementary education that can be said to be established on a satisfactory footing. (See *Britain*, and articles on other countries.) A complete system of national education ought to make satisfactory provision for primary or elementary education, secondary education, and higher or university education, besides providing for the due education of teachers, and for technical education, commercial education, artistic education, etc.; but how far education in any department should be free (or at the expense of the state) is a question on which authorities are not agreed. Elementary education is, generally speaking, free in France, Italy, Germany, the United States, Canada, several of the Australian colonies, and elsewhere. In a properly organized system the three great classes of educational institutions would be interdependent, the primary schools supplying pupils satisfactorily equipped for passing into the secondary schools, and these again passing on a certain number of their pupils to the university sufficiently equipped for entering on their more advanced studies. It is generally agreed that elementary education should be compulsory, and this is now the law in Britain, Germany, France, Italy, Denmark, many of the United States, etc.; but the law may exist with more or less laxity in the enforcement of it. The elementary schools have, as their special province, the teaching of those branches of education that everyone ought to be instructed in, such as reading, writing, arithmetic, grammar, geography, etc.; but they usually teach also a number of other subjects. The secondary schools include institutions known as high schools, academies, grammar schools, colleges, etc. The subjects taught in them are such as ancient and modern languages, mathematics, science, history, geography, etc., and they may prepare pupils who intend to engage in commerce or other business, and those who intend to proceed

to the university. Thus in some secondary schools there is a *modern side* and a *classical side* (or similar divisions); while in Germany there are the two distinct classes of schools, the 'real schools' (for modern subjects), and the gymnasia. The universities provide an education for the so-called 'learned professions,' as well as for all who appreciate the advantages of a university training. Their most characteristic feature is the privilege of granting university degrees. Systems of manual training schools are becoming common in the larger cities of the United States, and trade schools have recently been instituted, in which special trades are taught. There are also schools for the blind, and deaf and dumb, and others who need special methods of training. The kindergarten schools are primary institutions in which young children are given their first ideas of mental discipline.

Edward (ed'ward), known as *the Elder*, King of England, son of Alfred the Great, born about 870, succeeded his father in 901. His reign was distinguished by successes over the Danes. He fortified many inland towns, acquired dominion over Northumbria and East Anglia, and subdued several of the Welsh tribes. He died in 925.

Edward, surnamed the *Martyr*, King of England, succeeded his father, Edgar, at the age of fifteen, in 975. His reign of four years was chiefly distinguished by ecclesiastical disputes. He was treacherously slain in 979 by a servant of his stepmother, at her residence, Corfe Castle. The pity caused by his innocence and misfortune induced the people to regard him as a martyr.

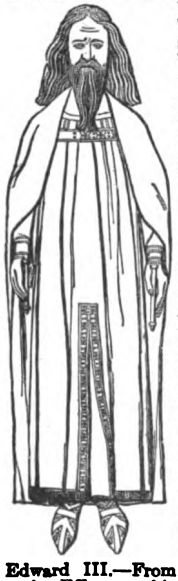
Edward, King of England, surnamed the *Confessor*, younger son of Ethelred II. On the death of his maternal brother, Hardicanute the Dane, in 1041, he was called to the throne, and thus renewed the Saxon line. Edward was a weak and superstitious, but well-intentioned prince, who acquired the love of his subjects by his monkish sanctity and care in the administration of justice. His queen was the daughter of Godwin, Earl of Kent. He died in 1066, and was succeeded by Harold, the son of Godwin. He caused a body of laws to be compiled from those of Ethelbert, Ina and Alfred, to which the nation was long fondly attached. He was canonized by Pope Alexander III in 1166.

Edward I (Plantagenet line) King of England, son of Henry III, was born at Winchester in 1239. The contests between his father and the barons called him early into active life, and he finally quelled all resistance to the royal authority by the decisive defeat of Leicester at the battle of Evesham, in 1265. He then proceeded to Palestine, where he showed signal proofs of valor, although, owing to the death of the French king, no conquest of any importance was achieved. On his return home he showed great vigor as well as a degree of severity in his administration. He commenced a war with Llewellyn, Prince of Wales, which ended in the annexation of that principality to the English crown in 1283. His next attempt was on the independence of Scotland. John Baliol, having been induced to do homage for his crown to Edward, was forced by the indignation of the Scottish people into war with England. Edward entered Scotland in 1296, devastated it with fire and sword, and placed the administration of the country in the hands of officers of his own. But next summer a new rising took place under the celebrated William Wallace. Wallace's successes recalled Edward to Scotland with an army of 100,000 men. Wallace was at length betrayed into his hands and executed as a traitor. But Edward's efforts to reduce the country to obedience were unavailing, and with the flight of Robert Bruce, Earl of Carrick, to Scotland, the banner of Scottish independence was again unfurled. Edward assembled another army and marched against Bruce, but lived only to reach Burgh-on-Sands, a village near Carlisle, where he died July 7, 1307. Edward I was wise in council and vigorous in action. During his reign great progress was made in the establishment of law and order throughout the land.

Edward II, King of England, born at Caernarvon Castle in 1284, and the first English Prince of Wales, succeeded his father, Edward I, in 1307. He was of an agreeable figure and mild disposition, but indolent and fond of pleasure. After marching as far as Cumnock, in Ayrshire, with the army collected by his father, he returned, dismissed his troops, and abandoned himself entirely to amusements. His weakness for a clever but dissolute young Gascon, Piers Gaveston, on whom he heaped honors without limit, roused the nobles to rebellion. Gaveston was captured and executed as a public enemy. Two years after, in 1314, Edward assembled an immense army to check the progress of Robert Bruce, but was completely defeated at Bannockburn. In 1322 he made another expedition against Scot-

land, but without achieving anything important. The king's fondness for another favorite, Hugh le Despenser, had made a number of malcontents, and Queen Isabella, making a visit to France, entered into a correspondence with the exiles there, and formed an association of all hostile to the king. Aided with a force from the Count of Hainault she landed in Suffolk in 1326. Her army was completely successful. The Despensers were captured and executed, and the king was taken prisoner and confined in Kenilworth, and ultimately in Berkeley Castle, where Mortimer, the paramour of the queen, sent two ruffians, who murdered the unhappy monarch, September 21, 1327.

Edward III, King of England, son of King Edward II. by Isabella of France, was born in 1313. On his father's deposition in 1327 he was proclaimed king under a council of regency while his mother's paramour, Mortimer, really possessed the principal power in the state. The pride and oppression of Mortimer now became so intolerable that a general confederacy was formed against him. The result was the seizure of Mortimer, October 10, 1330, and his execution. Edward now turned his attention to Scotland, and having levied a well-appointed army, defeated the regent, Douglas, at Halidon Hill, in July, 1333. This victory produced the restoration of Edward Baliol, who was, however, again expelled, and again restored, until the ambition of the English king was diverted by the prospect of succeeding to the throne of France. Other claims were superior, but Edward, collecting an army and accompanied by the Black Prince, crossed over to France. The memorable battle of Crécy followed, August 25, 1346, which was succeeded by the siege of Calais. In the meantime David II, having recovered the throne of Scotland, invaded England with a large army, but was defeated and taken prisoner by a much inferior force under Lord Percy. In 1348 a truce was concluded with France; but on the death of King Philip, in 1350, Edward again invaded France, plundering and devastating. Recalled home by a Scottish inroad, he retaliated by carrying fire and sword from Berwick to Edinburgh. In the meantime the Black Prince had penetrated from Guienne to the heart of France, fought the famous battle of Poitiers, and taken King John prisoner. A truce was then made, at the expiration of which (1359) Edward again crossed over to France and laid waste the provinces of Picardy and Champagne, but at length consented to a peace. This confirmed him in the possession of several provinces and districts of France which were entrusted to the Prince of Wales (the Black Prince). but gradually all the English possessions in France, with the exception of Bordeaux, Bayonne and Calais, were lost. King Edward died a year after his heroic son, June 21, 1377.



Edward III.—From the Effigy on his tomb in Westminster Abbey.

Edward IV, King of England, was born in 1441. His father, Richard, Duke of York, was grandson of Edward, Earl of Cambridge and Duke of York, fourth son of Edward III, while the rival line of Lancaster descended from John of Gaunt, the third son. The York line had intermarried with the female descendants of Lionel,

Edward IV.

the second son, which gave it the preferable right to the crown. Edward, on the defeat and death of his father at the battle of Wakefield, assumed his title, and having entered London after his splendid victory over the troops of Henry VI and Queen Margaret at Mortimer's Cross, in February, 1461, was declared king by acclamation. The victory of Towton, soon after his accession, con-

firmed his title, and three years after, on May 4, 1464, the battle of Hexham completely overthrew the party of Henry VI. The king now made an imprudent marriage with Elizabeth, widow of Sir John Grey, at the very time when he had despatched the Earl of Warwick to negotiate a marriage for him with the sister of the French king. He thus alienated powerful friends, and Warwick, passing over to the Lancastrian cause, gathered a large army, and compelled Edward to flee from the country. Henry's title was once more recognized by parliament. But in 1471 Edward, at the head of a small force given him by the Duke of Burgundy, landed at Ravenspur in Yorkshire, and his army, being quickly increased by partisans, marched swiftly on London and took the unfortunate Henry prisoner. Warwick now advanced with an army to Barnet, where a battle was fought, April 4, 1471, which ended in the death of Warwick, and a decisive victory on the part of Edward. Shortly afterwards Edward also met and defeated a Lancastrian army, headed by Queen Margaret and her son Edward, at Tewkesbury. The prince was murdered the day after the battle, and the queen was thrown into the Tower, where her husband Henry soon after died. Edward was preparing for another expedition against France when he was taken off by sickness in April, 1483, in the forty-second year of his age, and twenty-third year of his reign.

Edward V, King of England, the eldest son of Edward IV, was in his thirteenth year when he succeeded his father in 1483. He fell into the hands of his uncle, the Duke of Gloucester, who made himself king as Richard III, and caused the young king and his brother to be sent to the Tower, where, it is said, he had them smothered by ruffians.

Edward VI, King of England, son of Henry VIII, by Jane Seymour, was born in 1537. At his father's death he was only ten years of age. His education was entrusted to men of the first character for learning, under whose training he made great progress and grew up with a rooted zeal for the doctrines of the Reformation. His reign was, on the whole, tumultuous and unsettled. In October, 1551, the Protector Somerset, who had hitherto governed the kingdom with energy and ability, was deposed by the intrigues of Dudley, duke of Northumberland, who became all-powerful and induced the dying Edward to set aside the succession of his sisters, Mary and Elizabeth, and settle the crown upon Lady Jane Grey, to whom he had married his son Lord Guildford Dudley. He died in 1553.

Edward VII, King of England, eldest son of Queen Victoria and Prince Albert, was born at Buckingham Palace in 1841 and christened Albert Edward. After a careful education under private tutors and at the universities of Edinburgh, Oxford and Cambridge, he traveled in America in 1860 and in the East in 1862, and in 1863 married Princess Alexandra, eldest daughter of Christian IX, of Denmark. From this marriage were born three daughters and two sons,—Albert Victor, duke of Clarence (died in 1892), and George, duke of York. During his long period of life as Prince of Wales, he bore much of the burden of court ceremony and public function for the Queen, and in addition took an active part in promoting exhibitions, charitable enterprises, the housing of the poor, etc. He aided in the founding of the Royal College of Music, and to him was due the organization of the Imperial Institute. He visited India in 1875 and was enthusiastically received. In the same year he was appointed a Field Marshal in the British army and in 1883 in the German, and from 1874 to 1901 he was grand-master of the Masons. On January 22, 1901, he succeeded his mother on the throne, assuming the title of Edward VII. His coronation, fixed for June 26, 1902, was prepared for on a scale of great magnificence, but a severe illness, rendering necessary a surgical operation, caused its postponement to August 9, when he was solemnly crowned in Westminster Abbey. The early events of note in his reign were the closing of the South African war, the adding to the British colonial area of the Transvaal Republic and the Orange Free State, and the retirement of Lord Salisbury from his long service as premier. A later one was the alliance between Great Britain and Japan, followed by the more complete alliance of 1905. Friendly relations with France, and with other nations of Europe, were fostered by King Edward, who personally did much in bringing them about, but a commercial rivalry arose with Germany, accompanied by a naval one, in which Great Britain strove energetically to retain its supremacy in ships of war. A later event was the coming into power of the Liberals, after the Conservatives had retained almost unbroken rule for twenty years. Under this new administration the principle of old-age pensions was adopted, a vigorous and riotous contest for woman suffrage arose, and the

opposition of the House of Lords to the financial and other measures of the administration led to serious threats of abolishing or greatly curbing the power of this upper house of the British Parliament. Through all these dissensions and political changes Edward showed great discretion and won the reputation of a wise and able ruler. His astute policy in foreign matters aided in bringing about a number of important understandings and agreements with the powers of the world, and he came to be looked upon as the safety valve of European politics and the mentor of European monarchs. The dissension between the Lords and Commons weighed much on his mind, and while anxiously awaiting the course of events, he suddenly sickened and died, April 6, 1910. He was succeeded by his surviving son as George V.

Edward, Prince of Wales, surnamed the *Black Prince*, born June 15, 1330, the eldest son of Edward III and Philippa of Hainault. In 1346 he commanded part of the forces at the battle of Crécy, and earned the praise of his warlike father. It was on this occasion that he adopted the motto *Ich dien* (I serve), used by all succeeding Princes of Wales. In 1355 he commanded the army which invaded France from Gascony, and distinguished himself

Edward the Black Prince—Effigy at Canterbury.

the following year at the great battle of Poitiers. By the Peace of Brétigny the provinces of Poitou, Staintonge, Périgord, Limousin were annexed to Guienne and formed into a sovereignty for the prince under the title of the Principality of Aquitaine. A campaign in Castile, on behalf of Pedro the Cruel, and the heavy taxes laid on Aquitaine to meet the expenses, caused a rebellion, and ultimately involved him in a war with the French king. His own health did not allow him to take the field, and having seen his generals defeated he withdrew into England, and after lingering some time died (1376), leaving an only son, afterwards Richard II.

Edward, Thomas, a Scottish naturalist, born in 1814; died in 1886. The son of poor parents, he was apprenticed to a shoemaker and continued to work as such till nearly the end of his life, having on his scant earnings to support a wife and eleven children. Under such hard conditions of life he succeeded, by indomitable perseverance, in acquiring much knowledge of natural history and some fame as a naturalist. A biography of Edward, written by Mr. Smiles, appeared in 1876 (*Life of a Scotch Naturalist*), and being thus brought prominently before the public, a pension of £50 a year was shortly afterwards conferred on him by the queen.

Edwards (ed'ward), Amelia Blandford, an English novelist, born in 1831. As far back as 1853 she began to contribute to periodicals. Among her best-known novels are *Hand and Glove* (1859); *Half a Million of Money* (1865); *Lord Brackenbury* (1880). Besides novels Miss Edwards had written ballads and books of travel, and later devoted herself to Egyptology. She died in 1892.

Edwards, Bryan, an English writer, born in Wiltshire in 1743. He inherited a large fortune from an uncle in Jamaica, where he long resided. His *History, Civil and Commercial, of the British Colonies in the West Indies* appeared in 1793. He died in 1800.

Edwards, Jonathan, a celebrated American theologian and metaphysician, born at East Windsor, Connecticut, October 5, 1703. He entered Yale College in 1716, and studied till 1720; in 1722 received a license as preacher. In 1723 he was elected a tutor in Yale College, but resigned in 1726 to be ordained as minister at Northampton, Massachusetts. After more than twenty-three years of zealous service here he was dismissed by the congregation owing to the severity with which he sought to exercise church discipline. He then went as a missionary among the Indians at Stockbridge, in Massachusetts. Here he composed his famous work on *The Freedom of the Will*, a masterpiece of metaphysical argument. It appeared in 1754, and was completed within four months and a half. In 1758 he was chosen president of the college

at Princeton, New Jersey. He died in 1758.

Edwards, OLIVER, soldier, born at Springfield, Massachusetts, in 1835; entered the Union army in the Civil war and rose to the rank of brigadier-general in 1865. He rendered conspicuous general at the battles of the Wilderness and Spotsylvania, and at Sailor's Creek captured Generals Custis Lee and Ewell. He engaged in mercantile pursuits after the war.

Edwardsville, a city, capital of Madison Co., Illinois, on Cahokia Creek, 18 miles N. E. of St. Louis, Missouri. It has brass and marble works, brick plants, coal mines and other industries. Pop. 7274.

Edwardsville, a borough of Luzerne Co., Pennsylvania. It has brewing establishments and other industries. Pop. 8407.

Edwy (ed'wi), King of England, son of Edmund I, succeeded his uncle Edred in 955. Taking part with the secular clergy against the monks, he incurred the confirmed enmity of the latter. The papal party, headed by Dunstan, was strong enough to excite a rebellion, by which Edwy was driven from the throne to make way for his brother Edgar. He died in 959, being probably not more than eighteen or nineteen years old.

Eecloo (āk-lō'), a town of Belgium, province of East Flanders, 11 miles northwest from Ghent, the seat of various manufactures. Pop. 12,897.

Eel (ēl), the general name of a family of teleostean fishes belonging to the apodal section of the Malacopterygii. They belong to various genera. The genus *Anguilla* is characterized by its serpent-like, elongated body, by the absence of ventral fins, and the continuity of the dorsal and anal fins round the extremity of the tail. The dorsal fin commences half-way between the head and the anal fin, and the lower jaw projects beyond the upper. In the genus *Conger*, which is exclusively marine, the dorsal fin commences above the pectoral, and the upper jaw is the longer. The smoothness of the body—the scales being inconspicuous—and the serpentine movements of eels are proverbial. The species of the genus *Anguilla*, which are both fresh-water and marine, seldom exceed 30 inches in length. River eels are caught in great numbers by means of eel-bucks or eel-pots, traps consisting of a kind of basket with a funnel-shaped entrance composed of willow rods converging towards a point, so that the eels can easily force their way in, but cannot return. A stocking or tube of coarse cloth hanging from an aperture of a box down into the interior is also used. A kind of trident is used also for taking them, called an *eel-spear*. A fisherman wades to the shallows, and, striking his spear in the mud in every direction around him, the eels reposing on the bottom are caught between the prongs. They are also taken by hooks and lines and in other ways. Eels avoid cold, and frequently migrate in winter to the mud or brackish water of estuaries where the temperature is higher. They have even been met with in large numbers performing migrations on land, mostly intervening necks of soil covered with damp grass. Some eels spawn in the estuaries of rivers, and immense numbers of the young eels pass up the streams in spring, their passage in England being called the *eel-fare*. Eels are considered excellent food. See *Conger-eel*, *Electric Eel*.

Effendi (e-fen'di), a Turkish title which signifies lord or master. It is particularly applied to the civil, as *aga* is to the military officers of the sultan. Thus the sultan's first physician is called *Hakim effendi*, the priest in the seraglio *Iman effendi*, etc.

Effervescence (ef-er-ves'ens), the rapid escape of a gas from a liquid, producing a turbulent motion in it, and causing it to boil up. It is produced by the actual formation of a gas in the liquid, as in fermentation, or by the liberation of a gas which has been forced into it, as in aërated beverages.

Efficiency. See *Scientific Management*.

Effigy (ef'i-ji), an image or portrait, most frequently applied to the figures on sepulchral monuments.—*To burn or hang in effigy* is to burn or hang an image or picture of a person, a mode in which the populace sometimes expresses its feelings respecting an obnoxious personage.

Efflorescence (ef-lo-res'ens), the fine, white, feathery crystallization of sulphate and carbonate of sodium which appears on walls, or similar crystallizations on the surface of the earth, in decomposing rocks, etc. In medicine the term is applied to an eruption or rash, as in measles, etc.

Effluvium (e-flö'vi-um; pl. EFFLUVIA), a noxious or disagreeable exhalation.

Effodientia (e-fō-di-en'ti-a) digging animals), a term applied sometimes to the division of the Edentates which comprises the insect-eating

forms, as the hairy ant-eater of South America, the armadillo, etc.

Eft. See *Newt.*

Egalité (ā-gal-i-tā), PHILIPPE. See *Orleans, Louis Philippe Joseph.*

Egbert (eg'bert), considered the first king of all England, was of the royal family of Wessex. He succeeded Brihtric in 802 as king of Wessex. He reduced the other kingdoms and rendered them dependent on him in 829, thus becoming their overlord. He died in 839.

Egede (eg'e-de), HANS, the apostle of Greenland, was born in 1686 in Norway. In 1721 Egede set sail for Greenland with the intention of converting the natives to Christianity, and for fifteen years performed the most arduous duties as missionary, winning by his persevering kindness the confidence of the natives. In 1736 he returned to Copenhagen, where he was made a bishop and director of the Greenland Missions. He died in 1758.—His son, PAUL EGEDE, born in 1708, followed in his father's footsteps, became Bishop of Greenland, and died in 1789.

Eger (ā'gàr), a town of Bohemia, on a rocky eminence above the Eger, 91 miles west of Prague; once an important fortress, though now quite dismantled. It has manufactures of woolens, cottons, leather, soap, etc. Wallenstein was assassinated here (1634.) Pop. 23,665. For another Eger see *Erlau.*

Egeria (ē-jē'ri-a), a nymph who received divine honors among the Romans. Numa is said to have received from her the laws which he gave to the Romans.

Egerton, FRANCIS. See *Bridgewater, Duke of.*

Egg, a small spherical or oval mass specially developed in the body of the females of animals, and in which, by impregnation, the development of the young animal takes place. Birds, reptiles, fishes, insects and worms are oviparous, *i.e.*, bring forth eggs or ova, as do also, among mammalia, the ornithorhynchus and echidna. The egg contains the germ of the young animal, as well as the substance which serves for its nourishment. All it needs for its development is external heat. (See *Incubation.*) The eggs of animals lower than the birds have usually only three parts, viz. the germinal spot or dot, the germinal vesicle, and the vitellus or yolk; the first being contained in the vesicle, and that again in the yolk. Besides these parts the eggs of birds have the white or albumen, and the shell, which consists of a membrane coated with carbonate of lime. The eggs of birds, especially of fowls, are a pleasant and nutritive food. The common domestic fowl, the turkey, the pea-hen, and the common duck produce the eggs which are commonest in the market. Among reptiles, the turtles produce eggs which are good for eating. The eggs of fishes are their roe or spawn. A hen's egg of good size weighs about 1000 grains, of which the white constitutes 600, the yolk 300, and the shell 100. When the white of an egg is warmed it coagulates to a firm, opaque mass.

Egg, an island of Scotland. See *Eigg.*

Egga (eg'ga), a town of West Africa, on the right bank of the Niger, about 70 miles above the junction of the Binue. Pop. about 10,000.

Eggar (eg'gar), or EGGER, a name given to moths of the family *Bombycidæ, Lasiocampa trifolii,* a well-known British moth, is called the grass-egger, and the *L. roboris* the oak-egger, from the food of their caterpillars.

Egg-bird, *Hydrochelidon fuliginōsum,* a species of tern, a bird of considerable commercial importance in the West Indies, as its eggs, in common with those of two other species of tern, form an object of profitable adventure to the crews of numerous small vessels.

Egg-flip, a drink made of warmed beer, flavored with a little sugar, spirit, spices and eggs beaten with it.

Eggnog, a drink consisting of the yolks of eggs beaten up with sugar, milk, the whites of eggs whipped, and usually wine or spirits.

Eggplant (*Solānum melongēna*).

Eggplant (*Solānum melongēna*), nat. order Solanaceæ, a herbaceous plant, from 1 foot to 18 inches high, with large white or purplish flowers. The fruit is a sphere of considerable size, and generally yellow, white, or violet, and baked or fried in slices, is used as an article of food. It is cultivated in In-

dia, the United States, etc., and in European hothouses. There are several other species of eggplants, as *S. Indicum*, *S. sodomeum*, etc.

Egil Skallagrim (eg'il), an Icelandic bard or poet of the tenth century, who distinguished himself by his warlike exploits in predatory invasions of Scotland and Northumberland. Having fallen into the hands of a hostile Norwegian prince, he procured his freedom by the composition and recitation of a poem called *Egil's Ransom*, which is still extant.

Eggleston (eg'gelz-ton), EDWARD, an American novelist and historian, born at Vevay, Indiana, in 1837; died in 1902. He was a Methodist preacher in early manhood, and in 1874 founded the creedless church of Christian Endeavor. He wrote several popular novels, including *The Hoosier Schoolmaster*. *The Faith Doctor*, etc., also works on colonial history.

Eggleston, GEORGE CARY, author, brother of the preceding, was born at Vevay, Indiana, in 1830. He became a journalist in New York and wrote a large number of books, including several tales for the young. He died in 1911.

Eginhard (eg'in-ard), or EINARD, a Frankish writer, born about 1771, studied at Aix-la-Chapelle, under Alcuin. His talents and learning gained him the confidence of Charlemagne, who made him his private secretary and chaplain, and gave him his daughter Emma in marriage. On the death of the emperor, Eginhard took the cowl and became first abbot of the monastery at Seligenstadt, in Darmstadt, where he died in 844. Eginhard is the oldest German historian, and has left us a life of Charlemagne (*Vita Caroli Magni*), and *Annals of the Franks*, from 741 to 829. His letters, still extant, are also an important contribution to the history of the age.

Eglantine (eg'lan-tin), one of the names of the sweetbrier (*Rosa rubiginosa*), a kind of wild rose. The name has sometimes been erroneously used for other species of the rose and for the honeysuckle.

Egmont (eg'mont), LAMORAL, COUNT, was born in 1522, of an illustrious family of Holland. He entered the military service, accompanied Charles V in his African expeditions, and distinguished himself under Philip II in the battles of St. Quentin (1557) and Gravelines (1558). Philip having gone to Spain, Egmont soon became involved in the political and religious disputes which arose between the Netherlands and their Spanish rulers. He tried to adjust the difficulties between both parties, and in 1565 went to Spain to arrange matters with Philip. He was well received, sent back with honor, but quite deceived as to the king's real intentions. In 1567 the Duke of Alva was sent with an army to the Netherlands to reduce the insurgents. One of his first measures was to seize Count Egmont and Count Horn. After a trial before a tribunal instituted by Alva himself they were executed at Brussels, June 5, 1568. A well-known drama of Goethe's is founded on the story of Egmont.

Egoism (eg'ō-izm), as a philosophical doctrine, the view that the elements of all knowledge and the reality of the things known are dependent on the personal existence of the knower. Hence the logical position of the egoist is to doubt the substantial reality of everything except his own existence.

Egret (eg'ret), a name given to those species of white herons which have the feathers of the lower part of the back elongated and their webs disunited, reaching to the tail or beyond it at certain seasons of the year. Their forms are more graceful than those of common herons. The American egret (*Ardëa egretta*) is about 37 inches long to the end of the tail; plumage soft and blended; head not crested; wings moderate; the tail short, of twelve weak feathers. The European egret (*A. alba*) is about 40 inches long, of a pure white plumage; the bill is black or dark brown, yellow at the base and about the nostrils, and the legs are almost black. The little egret (*A. garzetta*) is about 22 inches long from bill to end of tail, the plumage is white.

Egripo (eg'ri-pō), a name of Chalcis (which see).

Egypt (ē'jipt; Greek, *Aiguptos;* Hebrew, *Misr* or *Misraim;* ancient Egyptian, *Chem* or *Chemi*, 'the black land'; Arabic, *Misr* or *Musr*), a country in the northeastern part of Africa, governed by a ruler (the *khedive* or viceroy) who pays tribute to the sultan of Turkey, but is virtually independent. Egypt is bounded on the N. by the Mediterranean Sea, on the E. by Arabia and the Red Sea, and on the W. by the Libyan Desert. Its natural southern frontier may be placed about Assouan (about 500 miles south of the Mediterranean), near which cultivated land almost disappears and the country begins to assume the features of the Nubian Desert. The authority of the khedive extends far southward over what is known as the

Egyptian Soudan, up to a few degrees from the equator, including Kordofan. Darfur, Barel-Ghasal, etc. This territory, acquired by conquest and known by the general name of the Soudan, was evacuated in 1885, as a result of a revolt of the people, under the Arab leader known as El Mahdi, against Egyptian authority. Wady Halfi about 670 miles south of the Mediterranean, remained the southern limit of Egypt from this date to 1896, when a new advance began, ending in the defeat of the Arabs at Omderman, near Khartoum, in 1898, the death in battle of the Khalifa, successor to the Mahdi, in 1899, and the recovery of the Soudan for Egypt by the Anglo-Egyptian army. (See *Soudan.*) A small strip of N. W. Arabia on the east of the Red Sea belongs to Egypt, as also the Sinaitic peninsula and the Isthmus of Suez. While the authority of Egypt thus extends over a great territory, the area of the inhabitable section of Egypt proper, that irrigated by the Nile, is only about 11,000 sq. miles. It has a population of 11,287,359, according to the census of 1907. The capital and largest town is Cairo, the next largest and chief seaport is Alexandria.

The inhabited portion of Egypt is mainly confined to the valley of the Nile, which, where widest (at the Delta), does not exceed 80 miles, and narrows steadily as we ascend its stream till, at the southern frontier, it is only 2 miles wide. The Nile has no tides, but runs constantly towards the sea at the rate of 2½ to 3 miles an hour. After it enters Egypt it flows in a northward direction, but with considerable bends till it reaches lat. 30° 15′, a little beyond Cairo, where it divides into two main streams, the Rosetta and Damietta branches, which enclose that portion of land known as the Delta and formed by deposits of alluvial matter. Bordering on the Mediterranean are several salt lakes or lagoons, Menzaleh being the largest, through which is carried the Suez Canal, connecting the Mediterranean and the Red Sea, and also passing through other salt lakes. About 150 miles south of the Mediterranean is the lake Birket-el-Kurun, fed by the Nile. As very little rain falls in Egypt, the prosperity of the country entirely depends upon the Nile, and especially upon the yearly overflow of the river, which so fertilizes the soil with a brown slimy deposit that it produces two crops a year. Beyond the limits of the inundation and of irrigation there is no cultivation whatsoever. The Nile begins to rise in June, and continues to increase until September, overflowing the low lands along its course, the waters being conveyed by canals where natural channels fail. The Delta then looks like an immense marsh interspersed with islands, villages, towns and plantations, just above the level of the water. After a few days the water begins to subside, and leaves the land again dry about the end of October. The seed is then sown, and artificial irrigation is maintained by water raised from the river, and distributed by means of channels throughout the fields. The appliances for raising water are simple and primitive; chiefly the *shadoof* worked by two men, and the *sakieh* driven by a donkey or an ox. (See *Shadoof.*) The land is soon covered with green crops, and the first harvest is in March.

At Cairo the valley of the Nile becomes well defined. It is bordered on the east by what are called the Arabian hills, and on the west by the Libyan ranges. Beyond the limits of the valley on the Libyan sides are five oases at intervals—those of Khârgeh, Dâkhel, Farâfra, Siwa and Bahrîyeh—islands of verdure and cultivation, in some of which artesian wells are numerous. The great oasis Wah-el-Khârgeh extends south for 100 miles. These oases are also dependent on the Nile like the rest of habitable Egypt, for the water to which they owe their existence is partly derived from the subterraneous percolation from that river. The territory to the east of the Nile is mainly a bare, rocky region, mountainous towards the coast, maintaining a small nomadic population. The broad plains of the Delta and the comparatively narrow valley of the river higher up make two natural divisions of Egypt, Upper and Lower. These were anciently regarded as separate kingdoms. The lower part of the valley, however, which includes the fertile tract adjoining lake Birket-el-Kurun, known as the Fayoum, differs so much from the higher part as to give rise to the division into Lower, Middle and Upper Egypt. The country is now divided into governorates and mudirîehs.

The atmosphere in Egypt is extremely clear and dry, the temperature regular and exceedingly hot. The winter months are the most delightful part of the year: later, the ground becomes parched and dry; and in May the suffocating khamseen, or simoon, begins to blow from the desert plains. Rain is scanty except near the seashore; but at night the dews are heavy in Lower Egypt, and the air cool and refreshing. Egypt is not remarkably healthy, as, in addition to visi-

tations of plague and cholera, ophthalmia, diarrhœa, dysentery and boils are very prevalent.

The rock formations of Egypt consist largely of nummulite limestone, especially at the Nile and in the Libyan Desert, and of granite, syenite, porphyry and other crystalline rocks in the Arabian Desert (between the Nile and Red Sea), with sandstone in the south. Over a great extent of Egypt the rocks are covered with shifting sands, and in the lands bordering on the Nile by the alluvium deposited during the inundations, and which consists of an argillaceous earth or loam, more or less mixed with sand. Among the useful minerals found in the country are granite, syenite, basalt, porphyry, limestone, alabaster, natron, bitumen, salt and sulphur.

Now as formerly there is little timber, the principal trees, besides the date-palm and tamarisk, being the sycamore fig and acacia or gum-arabic tree, which last does not attain to any size north of Wady Halfa. The papyrus plant, once so important, is now to be found only in one or two spots. Of it was manufactured a paper which was supplied to all the ancient world. Besides the lotus or water-lily of the Nile, Egypt has always been celebrated for its production of wheat, barley, a great variety of the bean class, leeks, garlic, onions, flax and for plants of the cucumber tribe. To the products of ancient times have been added the sugar-cane, cotton plant, indigo and tobacco.

Egyptian oxen were celebrated in the ancient world. The camel was early introduced; horses and asses have always abounded; sheep and goats are numerous; the cat is universal as a domestic animal. Wild animals include the hyena, jackal, fox, lynx, genet, ichneumon, jerboa, wild goat, gazelle and one or two other antelopes, hare, etc. The crocodile formerly reached the Delta, but is now seldom seen below Assouan. Water-fowl are plentiful; so are vultures and other birds of prey. The sacred ibis is still found in the south and the pelican in the northern lagoons. Among the countless insects are the sacred beetle, the locust and mosquito.

In spite of the fact that at least two and sometimes three successive crops may be gathered in a year, agriculture in Egypt is at present in a low state; and the poverty and generally wretched condition of the cultivators render improvement difficult. There are few trades which have attained a development of any importance. The tanning and pottery-making, however, deserve praise; coarse cotton cloths are made; silk is cultivated; and the sugar-cane is grown to a considerable extent. The commerce of Egypt is considerable, and has greatly increased since the construction of the Suez Canal and the railways. The railways have a length of about 1500 miles. The total value of exports in 1910 amounted to $130,000,000, that of imports to $110,000,000. About 50 or 60 per cent. of the commerce is with Britain. Accounts are kept in Egyptian pounds, each containing 100 piastres, and equivalent to $5.12.

Of the inhabitants of Egypt, those of the peasant class, or Fellahs, as they are called, appear to be descendants of the ancient Egyptians mixed with Arab blood. Having embraced Mohammedanism, they are often denominated Arabs, though regarded by the true Arab with contempt. The Copts are the descendants of the ancient Egyptians who embraced and still cling to the Christian religion. Though comparatively few in number, their education and useful talents enable them to hold a respectable position in society, as clerks, accountants, etc. With those aboriginal inhabitants are mingled, in various proportions, Turks, Arabs (chiefly Bedouins), Armenians, Berbers, negroes and a considerable number of Europeans, especially Greeks and Levantines.

The government of Egypt is in the hands of the khedive or viceroy, who is assisted by a ministry formed on the model of those of Western Europe. The title and government are hereditary, but the khedive, as a Turkish vassal, formerly paid an annual tribute to the sultan of $3,500,000. For some years previous to 1882 two controllers-general, appointed respectively by France and Britain, had extensive powers of control in the administration of the country; but in that year, the French having refused to lend assistance in putting down the rebellion of Arabi Pasha, a British army occupied Egypt, and the government has since been carried under the supervision of Britain, various reforms having been introduced. Egypt is much burdened with its large public debt, which amounts to the sum of $465,000,000. The chief items of revenue are the land-tax, producing over $25,000,000 a year, indirect taxes and railways. The annual revenue is about $75,000,000; expenditure nearly the same.

History.—The Egyptians are the earliest people known to us as a nation. When Abraham entered the Delta from Canaan they had been long enjoying the

advantages of a settled government. They had built cities, invented hieroglyphic signs, and improved them into syllabic writing, and almost into an alphabet. They had invented records, and wrote their king's names and actions on the massive temples which they raised. The arrangement of Egyptian chronology is still a much-disputed point among scholars. A list of the kings of Egypt, arranged in thirty dynasties, was given by the priest Manetho (about 250 B.C.), and this division is still used. His list, however, is in a very corrupt condition and his method is not strictly chronological. Hence in the various systems of chronology adopted by Egyptologists the dates assigned to Mena (or Menes) vary from 5702 to 2440 B.C. According to tradition, Mena formed the old empire of Egypt and founded its capital Memphis. The IVth Dynasty is distinguished as the 'Pyramid Dynasty.' Three of its kings, Khufu, Khafra and Menkaura (according to Herodotus, *Cheops*, *Chephren* and *Mykerinos*), built the largest pyramids. The date assigned to these kings in the chronology of Lepsius is 2800-2700, but these dates are very problematical. About 2400 the government of the empire seems to have been transferred from Memphis to Thebes, and with the beginning of Dynasty XII the Theban line was firmly established. The chief princes of this dynasty are Amenemhat I (2380), who seems to have extended the power of Egypt over a part of Nubia; Usurtasan I, who made further conquests in this direction; and Amenemhat III (2179), who constructed Lake Meri (Mœris), a large reservoir for regulating the water supply of the Nile. About 2100 Egypt was conquered by the Hyksos, a nomadic tribe that, its leaders being known in history as shepherd kings, invaded Egypt from the east and established its capital at Tanis (Zoan). The Theban princes seem, however, to have preserved a state of semi-independence, and at last a revolt commenced which ended by the shepherd kings being completely driven out of Egypt by King Aahmes (Amāsis) of Thebes (about 1600), the first of the XVIIIth Dynasty. With Aahmes and the expulsion of the Hyksos began the reigns of those great Theban kings who built the magnificent temples and palaces at Thebes. The kings of the other parts of Egypt sank to the rank of sovereign priests. Thutmes (or Thothmosis II) added Memphis to his dominion by his marriage with Queen Nitocris. Under Thutmes III and his successors there were successful expeditions against the Syrians and the Ethiopians. Amenhotep III set up his two gigantic statues in the plain of Thebes, one of which the Greeks called the musical statue of Memnon. The Ramessides form the XIXth Dynasty. They commence with Rameses I, who seems to have been of Lower Egyptian extraction. His grandson, the Great Rameses II, or Sesostris, was successful against the neighboring Arabs and covered Egypt with magnificent buildings. Rameses II was probably the Pharaoh who oppressed the Hebrews, and the exodus may have occurred under his successor Meneptah or Merenptah. Under the later Ramessides the Egyptian empire began to decay. A new dynasty, XXI, came to the throne with King Hirhor. The seat of their power was Tanis in the Delta. During this period a great number of foreigners, Libyans as well as Asiatics, established themselves in Egypt. About 961 Sheshenk I, the Shishak of the Bible, of a Shemite family from Bubastis, established a new dynasty (XXII). He attempted to restore Egyptian rule in the East, and conquered and plundered Jerusalem. After his death Egypt was torn by civil wars, and eventually the Ethiopians under Shabak (Sabako) conquered it (XXVth Dynasty). For a time it was subject alternately to Ethiopian and Assyrian princes, but in the seventh century the kings of Saïs once more restored its independence and prosperity to Egypt. Psamethik I (Psammetichus) warred successfully in Syria and Palestine. King Nekho (610-594) defeated Josiah, king of Judah, but his further progress was checked by Nebuchadnezzar. His sailors circumnavigated Africa. Uahbra (the Greek Apries, the Hophrah of the Bible) and Aahmes II (Greek Amāsis) followed. About 523 Canbyses, king of Persia, overran Egypt and made it a Persian province. During the reign of Cambyses the Egyptians suffered much oppression. After the Persian defeat at Marathon the Egyptians rose and recovered their independence for a short time, but were again subdued, and, in spite of two other revolts, Egypt remained a Persian province till Persia itself was conquered by Alexander the Great, B.C. 332.

Egypt now became a Greek state, many Greeks having been already settled in the country, and the Egyptians were treated as an inferior race. Alexandria was founded as the new Greek capital. On Alexander's death his general, Ptolemy, took possession of the throne and became the first of a Greek dynasty that for three hundred years made Egypt one of the chief kingdoms of the world.

The Ptolemies were magnificent patrons of letters and arts. Theocritus, Callimachus, Euclid the geometrician, the astronomers Eratosthenes and Aratus, etc., flourished under their rule. But while the Alexandrian Greeks managed to keep down the native Egyptians, they were themselves sinking under the Romans. Ptolemy Auletes went to Rome to ask help against his subjects, and the famous Cleopatra maintained her power only through her personal influence with Julius Cæsar and Mark Antony. On the defeat of Mark Antony by Augustus, B.C. 30, Egypt became a province of Rome. It was still largely inhabited by Greeks, and Alexandria became the chief seat of Greek learning and science. On the spread of Christianity the old Egyptian doctrines lost their sway. Now arose in Alexandria the Christian catechetical school, which produced Clemens and Origen. The sects of Gnostics united astrology and magic with religion. The school of Alexandrian Platonics produced Plotinus and Proclus. Monasteries were built all over Egypt; Christian monks took the place of the pagan hermits, and the Bible was translated into Coptic.

On the division of the great Roman Empire (A.D. 337), in the time of Theodosius, into the Western and Eastern empires, Egypt became a province of the latter, and sank deeper and deeper in barbarism and weakness. It was conquered in 640 A.D. by the Saracens under Caliph Omar. As a province of the caliphs it was under the government of the two celebrated Abbasides—Harun-al-Rashid and Al-Mamun—and that of the heroic Sultan Saladin. The last dynasty was, however, overthrown by the Mamelukes (1250); and the Mamelukes in their turn were conquered by the Turks (1516-17). The Mamelukes made repeated attempts to cast off the Turkish yoke, and had virtually done so by the end of last century, when the French conquered Egypt and held it till 1801; they were then driven out by the British under Abercromby and Hutchinson.

On the expulsion of the French a Turkish force under Mehemet Ali Bey took possession of the country. Mehemet Ali was made pasha, and, being a man of great ability, administered the country vigorously and greatly extended the Egyptian territories. At length he broke with the Porte, and after gaining a decisive victory over the Ottoman troops in Syria in 1839, he was acknowledged by the sultan as viceroy of Egypt, with the right of succession in his family. Mehemet Ali died in 1849, having survived his son Ibrahim, who died in 1848. He was succeeded by his grandson Abbas, who, dying in 1854, was succeeded by his uncle Said, son of Mehemet. After Said's death Ismail Pasha, a grandson of Mehemet Ali, obtained the government in 1863. His administration was vigorous but exceedingly extravagant, and brought the finances of the country into disorder. In 1866 he obtained a firman from the sultan granting him the title of khedive. In 1879 he was forced to abdicate under pressure of the British and French governments, and was replaced by his son Tewfik. In 1882 the 'national party' under Arabi Pasha revolted and forced the khedive to flee. On July 11 a British fleet bombarded Alexandria and restored the khedive, and at Tel-el-Kebir the forces of Arabi were totally crushed on September 13. British influence now became dominant in Egypt. A rebellion in the Soudan under the leadership of Mohammed Ahmed, the so-called mahdi, now gave the government trouble. In 1883 the forces of the Mahid annihiliated an Egyptian force under Hicks Pasha in Kordofan. British troops were now dispatched to Suakin and inflicted two severe defeats on the mahdi's followers there. But the British cabinet had resolved to abandon the Soudan; and General Gordon, already famous for his work in this district, was sent to effect the safe withdrawal of the garrisons (1884). By this time, however, the mahdi's forces were strong enough to shut the general up in Khartoum, and to take that place in January, 1885, Gordon being slain. Abbas Pasha succeeded as khedive in 1892, and in 1898 Khartoum was retaken by an Anglo-Egyptian army and the Soudan regained. As a result of the recent European war Egypt has been made a protectorate of Great Britain.

Ancient Civilization.—The civilization of the Egyptians had reached a high pitch from the earliest period to which we can trace their history. The masonry of the passages in the great pyramid has not been surpassed at any age. More than 2000 B.C. the Egyptians had duodecimal as well as decimal numbers; weights and measures adjusted to a pound of 1400 grains. In mechanical arts the carpenter, boatbuilder, potter, leather-cutter, glassblower and others are frequently represented on their ancient monuments, and we see the blowpipe, bellows and siphons; the press, balance, lever; the saw, the adze, the chisel, the forceps, the syringe, harpoon, razors; we have also glazed pottery, the

potter's wheel, and the kiln; and dated specimens of glass of the time of Thothmes III, 1445 B.C. Gold-beating, damascening, engraving, casting, inlaying, wire-drawing and other processes were practiced. The processes of growing and preparing flax, as well as the looms employed, are all depicted. The social and domestic life of the ancient Egyptians is pictured for us on the walls of their temples and tombs. The rich spent much of their time in hospitality and entertainments, especially of a musical kind. In the country districts the superintendence of the agricultural works or the fisheries on their estates was varied by the sports and pleasures of a country life. The lower orders were poor and uneducated, scantily fed and clothed, and held in contempt by the higher classes. But there was no strict separation into caste; and although the priests formed a ruling bureaucracy, the highest posts were open to the successful scholar. Next to the priesthood in importance was the military class or order, who were all landholders and bound to serve in time of war. Below these were the husbandmen, who paid a small rent to the king. Egyptian custom seems to have allowed but one wife, who occupied an honorable and well-established position as the 'lady of the house.'

The two main principles on which the religion of Egypt was based appear to have been the existence of an omnipotent Being, whose various attributes, being deified, formed a series of divinities; and the deification of the sun and moon. Each group of divinities formed a triad composed of a chief male deity, with a wife or sister and a son, as Osiris, Isis and Horus, or Amun, Maut and Khonso. Among the other gods of the Egyptian Pantheon are Ra, the sun, usually represented as a hawk-headed man. Mentu and Atmu are merely two phases of Ra, the rising and the setting sun. The worship of the bull Apis is connected with Osiris. Serapis is the defunct Apis, who has become Osiris. Seth or Set represents the power of evil. Ammon (Egyptian Amen), originally a local god, owed his importance to the greatness of his city, Thebes. Thoth was the chief moon-god, and is generally represented as ibis-headed. Anubis, the jackal-headed, belonged to the family of Osiris, and presided over mummification. Besides these deities the Egyptians worshiped beasts, reptiles and even vegetables, probably as symbols. The Egyptians believed in the transmigration of souls and in the existence of a future state, in which mankind would be rewarded or punished according to their actions while on earth.

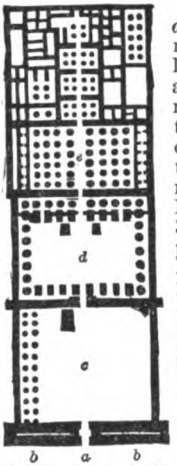


Fig. 1.—Plan of the Memnonium, Thebes.

Ancient Architecture and Sculptures.—The monuments we have left to us in Egypt are of two main periods—those built in the times of the Pharaohs or native kings, and those built during the rule of the Greeks and Romans (subsequent to 330 B.C.). The former period was by far the longer and more important, and to it belong the most characteristic examples of Egyptian architecture and sculpture, such as pyramids, vast temples, some of them cut in the solid rock (as at Ipsambul), rock-cut tombs, gigantic monolithic obelisks and colossal statues. The characteristic features of the style are solidity, boldness and originality. Among its peculiar characteristics may be noted—symmetry of structure; the gradual converging of the walls of some of its edifices, especially of the propylæa or tower gateways of its temples; roofs and covered ways being flat, and composed of immense blocks of stone reaching from one wall or column to another, the arch not being employed nor yet timber; columns numerous, close and

Fig. 2.—Types of Egyptian Columns.

massive, generally without bases, and exhibiting great variety in their capitals, from a simple square block to an elaborate composition of palm-leaves or other forms suggested by vegetation (Fig. 2); the employment of a large concave molding in the entablature, decorated with vertical fluting or leaves; walls and columns

decorated with a profusion of sculptures in outline or low relief representing divinities, men and animals, with innumerable hieroglyphics, brilliant coloring being often superadded. One remarkable feature associated with this style is the grandeur of its mechanical operations in cutting, polishing, sculpturing and transporting vast blocks of limestone and of granite. The pyramid is one of the best-known forms of Egyptian art, and there is little doubt that these structures were intended as the tombs of kings. The leading features of the Egyptian temples were these: a gateway flanked by two lofty *pylons* (Fig. 3) formed the entrance to a square court (see Fig. 1, *a* entrance, *b b* pylons, *c* court). From this court the way leads through a second gateway to an inner court (*d*), surrounded by a colonnade. Beyond this is the chamber of the temple known as the Hall of Columns (Fig. 1 *e*, and Fig. 4), the center avenue of which was higher than the rest of the hall, and consisted usually of twelve columns, which supported a flat roof formed of massive stones, light being admitted at the sides of this elevated portion. To the Hall of Columns succeeded a series of smaller chambers, the roofs of which were generally supported by six or four columns. These apartments frequently surrounded a dark chamber—the most sacred in the temple—the holy of holies. The surface of each architectural feature was engraved with its particular ornament appropriately colored. In the *cavetto*, or hollow molding of the cornice, it was customary to place the name and titles of the Pharaoh or king; the architrave stone was symbolically ornamented with the names and divinities to whom the temple was dedicated, and of the sovereign in whose time it was built. The abacus of the column was invariably decorated with the royal titles. The capitals were painted in accordance with the intention of the form; if, for instance, the expanded papyrus was shown, the leaves of the calyx would be yellow and the filaments green. Beneath were horizontal bands of blue and white, and then a representation of the king offering gifts to the gods of the temple; and, finally, the yellow and red lines at the base of the shaft signified the brown leaves that envelop the base of the stalk of the natural plant. The Egyptian temple was invariably rectangular, with its walls inclining inwards, and never more than one story high, and the approach to it

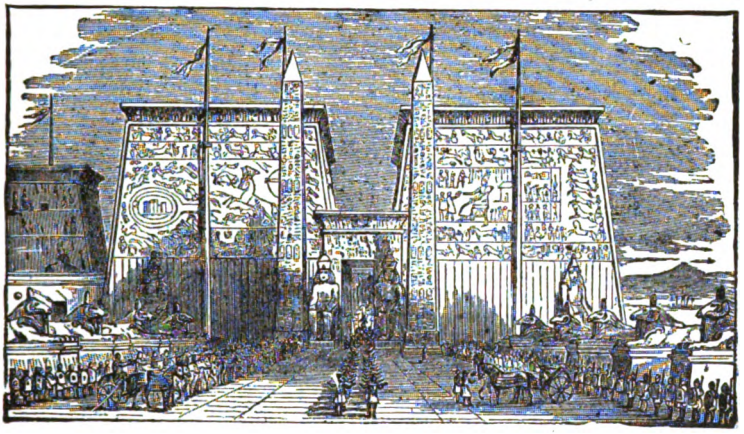


Fig. 3.—Restoration of the Propylon or Gate of the Temple of Luxor.

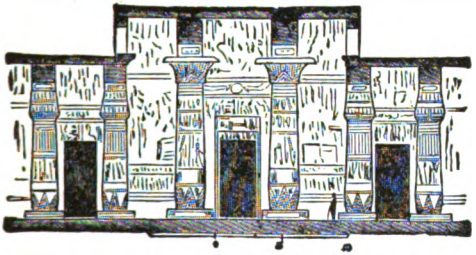


Fig. 4.—Hall of Columns in the Memnonium—Time of the Pharaohs.

was frequently through an avenue of sphinxes (Fig. 3). The temples built

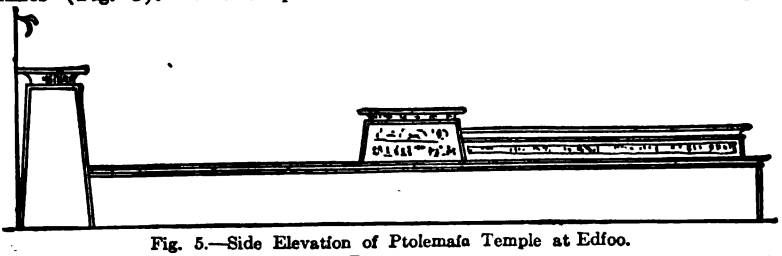


Fig. 5.—Side Elevation of Ptolemaic Temple at Edfoo.

during the sway of the Greeks and Romans, though having a general resemblance to the earlier ones, differed in some respects, as in the use of more elaborate capitals, more salient forms in the architectural and sculptural decorations, etc. (The side elevation of a Ptolemaic temple is shown in Fig. 5, the plan in Fig. 6.) A peculiar kind of mural sculpture was practiced among the Egyptians, the outline of the object to be represented being cut into the surface, while the minor forms and rotundity are shown within this incised outline, thus forming a kind of 'hollow relief.' For further illustrations of Egyptian architecture, see *Architecture, Esneh, Karnak;* and for an account of the hieroglyphics of ancient Egypt see *Hieroglyphics.*

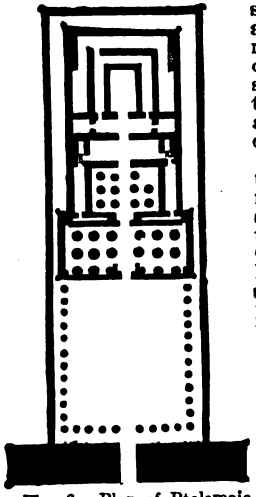


Fig. 6.—Plan of Ptolemaic Temple at Edfoo

Egyptian Bean, a name sometimes given to the bean-like fruits of the *Nelumbium speciosum,* or sacred lotus, found in China, India, Australia, but no longer on the Nile.

Egyptian Blue, a brilliant pigment consisting of the hydrated protoxide of copper mixed with a minute quantity of iron.

Egyptian Vulture (*Neophron percnoptĕrus*), a bird that frequents both shores of the Mediterranean, but rarely passes farther north. It is one of the smaller vultures, about the size of a raven. The general color is white; the quill feathers of the wing are dark brown.

Egyptology (ē-jip-tol'ō-ji), that branch of knowledge which deals with the language, history, etc., of ancient Egypt.

Ehrenberg (ā'ren-berh), CHRISTIAN GOTTFRIED, a German scientist, born in 1795; died in 1876. After studying theology, medicine and natural history, he joined in 1820 an expedition to Palestine, Egypt and Abyssinia. In 1829 he accompanied Humboldt to the Ural and Altai ranges and to Central Siberia. His great work on *Infusoria* appeared in 1838. It was followed in 1854 by his *Microgeology.*

Ehrenbreitstein (ā'ren-brīt-stīn), a Prussian fortress of great strength situated opposite the confluence of the Moselle with the Rhine, on a precipitous rock 387 feet above the river. The fortifications, which were erected in 1816-26 at a cost of $6,000,000, can accommodate a garrison of 14,000 men, and possess room for stores to last an army of 60,000 for a year.

Ehrlich, PAUL, German physician, born at Strehlen, Prussia, in 1854. He was connected with the Institute for Infectious Diseases, Berlin, 1890-96, and in 1896 became director of the Royal Institute for Experimental Therapy, now at Frankfort. His studies of the cell and its toxins laid the foundation for the practical technique of immunization. He received the Nobel prize for medicine in 1908. Died 1915.

Eibenstock (ī'ben-stok), a town in the southeast of Saxony, with important manufactures of lace. Pop. (1905) 7460.

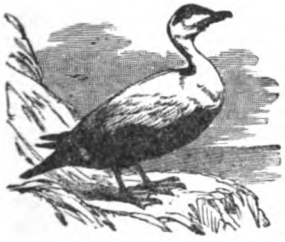
Eichhorn (īh horn), JOHANN GOTTFRIED, a German orientalist, historian, etc., born in 1752. He became professor of oriental languages at Jena, and then at Göttingen. He died in 1827. Among his works are the *Hebrew Prophets, History of Literature, History*

of the Three Last Centuries, Introductions to the Old and New Testaments and to the Apocrypha.

Eichstätt (īh'stet), an old town of Bavaria, in a deep valley of the Altmühl, 67 miles N. N. W. of Munich. Its principal edifice is a fine Gothic cathedral, founded in 1259. Pop. (1905) 7703.

Eider (ī-dĕr), a river of Prussia, which rises in Holstein, and forms the boundary between Schleswig and Holstein, falling into the North Sea at Tönning after a course of 92 miles. By its junction with the Schleswig-Holstein Canal it gives communication between the North Sea and the Baltic.

Eider Duck (*Somateria mollissima*), a species of duck found from 45° north to the highest latitudes yet visited, both in Europe and America. Its favorite haunts are solitary rocky shores and islands. In Greenland and Iceland it occurs in great numbers, and also breeds on the western islands of Scotland. The eider duck is about twice



Eider Duck (*Somateria mollissima*).

the size of the common duck, being about 2 feet 3 inches in length, 3 feet in breadth of wing, and from 6 to 7 pounds in weight. The male is black, head and back white, with a black crown. The female is reddish drab spotted with black, and with two white bands on the wings. They feed largely on shellfish, crustaceans, etc. Their nests are usually formed of drift grass, dry sea-weed, etc., lined with a large quantity of down, which the female plucks from her own breast. In this soft bed she lays five eggs, which she covers over with a layer of down. If this, with the eggs, is removed the bird repeats the process. One female generally furnishes about ½ lb. of down, but the quantity is reduced by cleaning. This down, from its superior warmth, lightness and elasticity, is in great demand for beds and coverlets; and the districts in Norway and Iceland where these birds abound are guarded with the greatest vigilance as a most valuable property. As found in commerce this down is in balls of the size of a man's fist, and weighing from 3 to 4 lbs. It is so fine and elastic that 5 lbs. of the best quality is sufficient for a whole bed. The down from dead birds is little esteemed, having lost its elasticity. The king eider duck (*Somateria spectabilis*) is another species resembling the preceding and inhabiting the same coasts.

Eiffel Tower. See *Paris*.

Eight-Hour Law, an act adopted in 1868, by the United States Congress, and afterward by a number of the state legislatures, providing that in all government employment eight hours shall constitute a day's work. Eight hours as the limit of a regular day's labor has since been adopted in a number of industries and is being demanded in others. Trade-union activity has resulted in the eight-hour day being generally adopted in the building trades, in certain branches of the iron and steel industry, in marble and stone work, newspaper printing and publishing, shipbuilding, cigar manufacturing, bituminous coal mining, and typographical work, the last as the result of an extensive strike in 1906. In England the movement has not yet been accorded general legislative sanction. Hours of labor, however, have been reduced in British government factories. See *Adamson Law*.

Eikon Basiliké (ī'kon ba-sil'ikē; Greek, 'the royal image'), the name of a book published shortly after the execution of Charles I, in January, 1649, and supposed by some to have been written by the king himself. At the Restoration, Gauden, afterwards Bishop of Worcester, laid claim to the authorship, and a memorandum in the copy of the Earl of Anglesea, lord privy-seal under Charles II, affirms his claim with the authority of Charles II and the Duke of New York. Forty-eight thousand copies were sold within a year of its publication, and the republicans put forward Milton to answer it, his *Eikonoklastes* (that is, 'image-breaker') appearing the same year, by order of Parliament. The *Eikon Basiliké* professes to be a sort of private journal of the king, containing numerous assertions of love for his misguided and ungrateful people.

Eildon Hills (ēl'don), three picturesque, conical-shaped hills, south of Melrose, Roxburghshire, Scotland, reaching a height of about 1400 feet, said to have been cleft in three by Thomas the Rhymer.

Eileithyia (ī-lī-thī'ya), an ancient Egyptian city, on the

Nile, some distance above Esneh. Important remains have been obtained from rock tombs in the neighborhood, and there are several ruined temples. Modern name, El Kab.

Eilenburg (ī'lĕn-bŭrh), a town of Prussian Saxony, 26 miles N. N. E. of Merseburg, on an island of the Mulde. It has manufactures of calico, etc. Pop. (1905) 15,147.

Eimbeck (īm'bek), or EINBECK, a town of Prussia, province of Hanover, on the Ilme, near its junction with the Leine, 40 miles south of Hanover. Pop. (1905) 8709.

Einsiedeln (īn'zē-dĕln), a village and district of Switzerland, in the canton of and 9 miles north by east of Schwyz, 3000 feet above the sea, celebrated for its Benedictine abbey. An image of the Virgin, alleged to possess miraculous powers, annually attracts immense numbers of pilgrims. Pop. 8496.

Eirenikon (ī-rē'ni-kon), a name given to works having as their object the reconciliation of opposite schools in politics or theology.

Eisenach (ī'zĕn-ăh), a town of Germany, in the grand-duchy of Saxe-Weimar, near the mountains of Thuringia, at the junction of the Nesse and Hörsel. It is an attractive town, and contains a grand-ducal castle. It has manufactures of pottery, leather, woolen yarn, etc. Sebastian Bach was born here in 1685. Near it lies the Wartburg, where Luther was kept for safety in 1521-22. Pop. (1910) 38,562.

Eisenberg (ī'zĕn-berh), a town of Germany, duchy of Saxe-Altenburg, with a ducal palace and various manufactures. Pop. (1905) 8824.

Eisk. See *Icisk.*

Eisleben (īs'lā-bĕn), a town of Prussian Saxony, 25 miles northwest of Merseburg, celebrated as the place where Luther was born and where he died. There are many memorials of Luther, and also a bronze statue of the reformer erected in 1883. Copper is extensively worked in the neighborhood. Pop. (1905) 23,898.

Eisteddfod (ī'steth-vŏd), an ancient assembly of Welsh bards for the purpose of musical and poetical contests, the judges being originally appointed by commissioners from the native princes, and after the conquest from the English kings. The last was issued in 1568, but the ancient custom was revived in 1798 by the Gwynnedigion Society, and on a more elaborate scale by the Cambrian Society, which grew out of the Gwynnedigion. Eisteddfods are now held annually.

Ejectment (ē-ject'ment), in law, an action wherein the title to lands and tenements may be tried and the possession recovered. It is commenced by a writ addressed to the tenant in possession and all entitled to defend the possession, bearing that the plaintiff lays claim to the property in question, and calling upon all interested to appear within a certain time to defend their right, failing which the tenant in possession will be ejected. In its older form the action was remarkable for certain curious legal fictions on which procedure was based; and the names of John Doe, an imaginary plaintiff, and of Richard Roe, an equally imaginary defendant, were long familiar in cases of this kind in the English courts.

Ejoo, a kind of fiber. See *Gomuti.*

Ekaterinburg (ye-kå-tye-ren-bŏrk'), a town of Russia, in the government of, and 170 miles S. E. of the city of Perm, founded in 1723 by Peter the Great. It is the center of the mining and metallurgy of the Ural region; and gem-cutting, the making of machinery, cloth, candles, etc., are industries. Pop. 55,488.

Ekaterinodar (ye-kå-tye-rē-nå-dăr'), a town of Russia in the Caucasus, chief town of the Kuban territory, on the river Kuban, a poorly built place with a considerable trade. Pop. (1911) 99,600.

Ekaterinoslav (ye-kå-tye-rē-nå-slåf'), a town of southern Russia, capital of a government of the same name, on the right bank of the Dnieper, 250 miles N. E. of Odessa. It was founded in 1787 by Prince Potemkin, and consists of a number of long, broad and dirty streets. Pop. (1911) 195,870. The government which is intersected by the Dnieper and at one point reaches the Sea of Azov, mostly consists of steppes; area, 24,478 square miles; pop. est. (1906) 2,708,700.

Elæagnaceæ (el-ē-ag-nā'se-ē), the oleaster family of plants, a small nat. order of apetalous exogens found in every part of the northern hemisphere, but comparatively rare south of the equator. It includes 4 genera and 30 species.

Elæis (el-ē'is), a genus of palms of which the African oil-palm (*Elæis quineënsis*) is one of the most important.

Elæocarpus (el-ē-ō-kär'pus), a genus of trees, nat. order Tiliaceæ, natives of India and Australia and

the isles between. The fruit is used in curries or pickled like olives.

Elæodendron (e l - ē - ō-den'dron), a genus of Asiatic and African trees, order Celastraceæ, some of which yield useful oils and timber.

Elæometer (el-ē-om'e-tėr), a hydrometer for testing the purity of olive and almond oils, by determining their densities.

Elæoptene (el-ē-op'tēn), the liquid portion of volatile oils, as distinguished from the concrete or crystallizable portion called *stearoptene.*

Elagabalus (el-a-gab'a-lus). See *Heliogabalus.*

Elain (e-lā'in), the oily principle of fat obtained by submitting fat to the action of boiling alcohol, allowing the stearin to crystallize, and then evaporating the alcoholic solution. It possesses much the appearance and properties of vegetable oil, and forms soaps with alkalies.

Elam (ē'lam), the ancient name of a country or region in Asia, east of the Lower Tigris. A king of Elam is said in the cuneiform inscriptions to have conquered Babylonia and Assyria about 2300 B.C. It was latterly incorporated in the Persian Empire.

Eland (ē'land), *Oreas Canna*, a species of antelope inhabiting Africa, the largest of all the antelopes,

Eland (*Oreas Canna*), male, female and young.

being about the size of an ox. Its flesh, especially that of the thighs, which is dried and used in this state, is highly prized, and consequently the animal is now nearly exterminated in the neighborhood of Cape Colony, where it was once common. The color is a light or grayish brown, and it possesses a short mane. The horns, which are about 18 inches long and nearly straight, are spirally keeled.

Elanet (el'a-net), the name of certain species of raptorial birds of the genus *Elānus*, and nearly allied to the kites. Such are the black-winged falcon (*E. melanopterus*) of Africa, Asia and New Zealand, and the black-shouldered hawk (*E. dispar*) of America.

Elaps (ē'laps), a genus of poisonous snakes, the type of the family Elapidæ, to which belongs the cobra di capello.

Elasmobranchii (el-as-mō-b r a n g'-ki-ī), an order of fishes, including the sharks, dogfishes, rays and chimæra, in which the skull is not composed of distinct bones, but simply forms a kind of cartilaginous box, the vertebral column sometimes cartilaginous, sometimes consisting of distinct vertebræ, the integumentary skelton in the form of placoid scales, the intestine being very short, and provided with a spiral valve. They have two pairs of fins (pectorals and ventrals), corresponding to the fore and hind limbs, and the ventral fins are close to the anus. The heart consists of an auricle, a ventricle and a muscular arterial bulb. The gills are fixed, and form a number of pouches, which open internally into the pharynx, communicating outwardly by a series of apertures placed on the side of the neck.

Elasmodon (e-las'mo-don), a subgenus of the genus *Elephant*, under which are included the mammoth and Asiatic species, the African elephant belonging to the subgenus *Loxodon.*

Elasmotherium (e-las-mo-thē'ri-um), an extinct genus of mammalia, found in the post-pliocene strata of Europe, comprising animals of great size allied to the rhinoceros, and having two horns the one behind the other.

Elastic Bitumen, ELATERITE or MINERAL CAOUTCHOUC, an elastic mineral resin of a blackish-brown color, and subtranslucent.

Elasticity (e-las-tis'i-ti), the property in virtue of which bodies resist change of volume and change of shape, and recover their for-

mer figure or state after external pressure, tension, or distortion. The former is called elasticity of volume, the latter elasticity of shape. The name *Compressibility* is also used in connection with the elasticity of volume; and *Rigidity*, or resistance to change of shape, in connection with that of shape. Fluids possess no rigidity whatever; they offer no *permanent* resistance to change of shape; while a solid body, unless it is distorted beyond certain limits, called the *limits of elasticity*, tends to return to its original form. Both fluids and solids possess elasticity of volume, and tend to resume their original volume after compression. The elasticity of volume of the former is perfect; whatever compression they have been subjected to, they return under the same conditions of temperature to precisely their original volumes when the forces of compression are removed. In the case of solids there are limits to their elasticity of volume as well as to their elasticity of form; thus, gold may be made permanently denser by hammering. There is one law of elasticity, the celebrated law of Hooke—*Ut tensio sic vis*, which translated into the modern language of elasticity stands—*Strain is proportional to stress;* or, in other words, whatever be the nature of the distortion the amount of it is proportional to the stress that produces it. This law is only considered applicable so long as we do not go beyond the limits of elasticity. See also *Boyle's Law.*

Elater (el'a-tẽr), the name of a family (Elateridæ) of beetles, remarkable for their ability to throw themselves to a considerable height in the air, when placed on their back, by a vigorous muscular movement. Hence their names of springing-beetles, click-beetles, skip-jacks, etc. When alarmed, the elater counterfeits death. Flowers, grass and decaying wood are the habitations of these animals, which are almost always found singly. The larvæ are often very injurious to vegetation, especially those which devour the roots of herbaceous plants (as in the genus *Agriōtes*), and are known from their slenderness and hardness as wire-worms. The fireflies of America belong to the family. They possess luminous properties, which are unlike those of the glow-worm, etc., being seated near the head. The *Pyrophŏrus noctilūcus*, called *cocuyo* in Brazil, is used as a personal ornament by ladies. The largest species of the genus *Elater*, the *Elater flabellicornis*, is 2½ inches in length.

Elaterium (e-la-tẽ'ri-um), a substance obtained from the fruit of the squirting or wild cucumber (*Ecballium agreste*). The juice of the unripe fruit when expressed and allowed to stand deposits elaterium as a green sediment with an acrid taste, a faint odor, and powerful cathartic properties. It is a violent purgative, and is poisonous, but its action is not constant. The active principle in it is called *elaterin.*

Elatinaceæ (e-la-ti-nā'se-ē), the water-pepper family, a nat. order of herbaceous annuals found in marshy places in all quarters of the globe.

Elba (elba; Lat. *Ilva*), a small island in the Mediterranean, in the province of Livorno (Leghorn), Italy, separated from the mainland by the Strait of Piombino, about 6 miles wide. The island is 18 miles long and from 2½ to 10½ miles broad, and is traversed by mountains rising to a height of over 3000 feet. It is rich in iron, marble, granite, salt, etc.; and iron ore is exported. Excellent wine and fruits are produced. It has two seaports—Porto Ferrajo (the capital) and Porto Longone. The Treaty of Paris in 1814 erected Elba into a sovereignty for Napoleon, who resided in it from May 4, 1814, to February 26, 1815. Pop. 25,043.

Elbe (elb; Ger. pron. el'be; Lat. *Albis;* Bohemian, *Labe*), a river of Germany, one of the largest in Europe. It rises on the S. W. slopes of the Schneekoppe or Snowcap, one of the Riesengebirge, between Bohemia and Silesia. From this point it flows nearly due S. into Bohemia for about 50 miles, when it turns to the W., and after about 40 miles takes a general N. N. W. direction till it falls into the North Sea, intersecting Saxony, a considerable portion of Prussia, and in the latter part of its course separating Holstein on its right from Hanover on the left. The length, including windings, is upwards of 780 miles. The principal affluents are, on the right, the Iser, Schwarz-Elster and Havel; on the left, the Alder, Moldau, Eger, Mulda and Saal. In the lower part of its course the river is divided by five large and seven small islands into several arms, which unite again about 5 miles below Hamburg. The mean depth is 10 feet, average breadth 900 feet. It is more or less navigable for about 470 miles, but its estuary at Cuxhaven is much encumbered with sandbanks. It is well stocked with fish. On July 1, 1870, the navigation of the Elbe was declared free from Hamburg to Melnik in Bohemia.

Elberfeld (el'bĕr-felt), a town of Rhenish Prussia, in the government of and 15 miles E. of Düsseldorf, on both sides of the Wupper, enclosed by lofty hills. Taken with Barmen it stretches along the Wupper Valley for about 6 miles. It has no historical or antiquarian importance, its prosperity, which is of recent date, being largely due to the cotton manufacture, of which it is the center in Rhenish Prussia. Linen, woolen, silk and mixed silk goods, ribbons and velvet are extensively made and exported. There are numerous mills for spinning cotton twist, linen yarn and worsted, and numerous dyeworks, and miscellaneous industrial establishments. The environs are mostly taken up with bleach-fields. Pop. (1910) 170,118.

Elberton (el'ber-tun), a city, capital of Elbert Co., Georgia, 34 miles E. by N. of Athens. It has cotton mills, fertilizer works, etc. Pop. 6483.

Elbeuf (el-beuf), a town of France, dep. Seine-Inférieure, 11 miles S. S. W. of Rouen, in a valley on the left bank of the Seine. It is well built, and has eight artesian wells. It has spinning-mills, dyeworks and is an important center for the production of woolen manufactures, chiefly of lighter cloths and fancy goods. It is also an entrepôt for the finer and heavier cloths of Louviers and Sedan. It communicates by steamers with Paris, Rouen and Havre. Pop. (1906) 17,800.

Elbing (el-bing), seaport town of West Prussia, on the Elbing, near its entrance into the Frische-Haff. It was once a flourishing Hanse town, and is still a place of considerable industry and trade, the manufactures including iron goods, machinery, brass and tinplate goods. It has also shipbuilding yards. Pop. (1916) 58,632.

Elbruz (el'bröz), a mountain summit of the Caucasus (which see).

Elburz (el'bŏrz), a lofty mountain range extending over Northern Persia, paraliel with and overlooking the Caspian. Highest peak, Mt. Demavend, 19,400 feet; average height, 6000 to 8000 feet.

Elcaja (el'cā'jà), an Arabian tree (*Trichilia emetica*), the fruit of which is used as an emetic, and to compose an ointment to cure the itch.

Elcesaites (el-se'să-its), a sect of Gnostics which arose in the reign of Trajan about the beginning of the second century. They were a branch of the Essenes and resembled the Ebionites. A Jew, named Elxai, or Elkesai, is their reputed founder.

Elche (el'chā), a town of Spain, in the province of and 14 miles W. S. W. of Alicante, on the left bank of the Vinalopo, surrounded by palm trees. It contains various Roman remains, a fine church, and a town house of the fifteenth century. Chief industry, the culture of dates. Pop. 27,308.

Elchingen (el'*h*ingen), Ober and Unter, two villages of Bavaria, on the left bank of the Danube, about 3 miles apart and 8 northeast of Ulm. In 1805 Marshal Ney defeated the Austrians at Ober Elchingen, and won for himself the title of Duke of Elchingen.

Elder (el'dẽr), a name given to different species of the genus *Sambŭcus*, nat. order Caprifoliaceæ. These are small trees or shrubs, with opposite and pinnated leaves, bearing small, white flowers in large and conspicuous corymbs, small berries of a black or red color, and bitter and nauseous leaves possessing purgative and emetic properties. The wood of the young shoots contains a very large proportion of pith. The common elder of Europe (*S. nigra*) is a wild shrub or small tree, distinguishable by its winged leaves; its clusters of small, cream-white flowers, and the small black berries by which these are succeeded, and from which a kind of wine is sometimes made. The dwarf elder or danewort (*S. Ebulus*) is found in many parts of Britain, and was vulgarly supposed to have sprung from the blood of the Danes. Two species are native to North America; *S. Canadensis*, a common plant from the forty-ninth to the thirtieth parallel of latitude, the berries of which are black and have a sweet taste; and *S. pubescens*, which bears red berries, and inhabits Canada, the northern parts of New England and the Alleghany Mountains. Elder wood is yellow, and in old trees becomes so hard that it is often substituted for boxwood. Its toughness also is such that it is made into skewers, tops for fishing-rods, etc. The light pith is utilized for balls for electric experiments, and various ointments, drinks and medicinal decoctions are made from the bark, leaves, flowers and berries.

Elders (el'dẽrz), persons who, on account of their age, experience and wisdom, are selected for office, as among the Jews, the seventy men associated with Moses in the government of the people. In the modern Presbyterian churches elders are officers who, with the pastors or ministers, compose the consistories or kirk-sessions, with authority to inspect and regulate matters of religion and discipline in the congrega-

tion. As a member of the kirk-session the elder has an equal vote with his minister, and as a member of the higher church courts, when delegated thereto, he has a right to reason and vote on all matters under discussion in the same manner as the clergy themselves.

Eldon (el'don), JOHN SCOTT, EARL OF, lord-chancellor of England, was born in 1751 at Newcastle-on-Tyne, where his father was a coal dealer and public-house keeper of means. He was educated with his brother William (afterwards Lord Stowell) at Newcastle, and at Oxford, where he obtained a fellowship. He was called to the bar in 1776, and in 1782 was made king's counsel. Next year he entered parliament, supported Pitt, and was made solicitor-general, and knighted. In 1792 he purchased the estate of Eldon. In 1793 he became attorney-general, and in 1799 was created chief-justice of the Court of Common Pleas, and raised to the peerage and the House of Lords by the title of Baron Eldon. On the accession of the Addington ministry he became lord-chancellor (1801), and retained this post under the subsequent administration of Pitt until the death of the latter in 1806. A year later, however, he resumed the chancellorship under Liverpool, and held it without break for twenty years. In 1821 he was created an earl by George IV. On the accession of the Canning ministry in 1827 he resigned the chancellorship, and never again held office. He died in London in 1838 at the age of eighty-six. As a lawyer he was a master of English jurisprudence; as a politician he was opposed to reform, and by no means free from the charge of servility and intrigue.

El Dorado (el dō-rä'dō) a country that Orellana, the lieutenant of Pizarro, pretended he had discovered in South America, between the Orinoco and Amazon rivers; and which he named thus on account of the immense quantities of gold and precious metals which, he asserted, he had seen in Manoa, the capital of the country.

Eleanor Crosses (el'i-nor), memorial crosses erected on the spots where the bier of Eleanor, the wife of Edward I. rested on its way from Grantham to Westminster. Thirteen were erected, but only three, those of Northampton, Geddington and Waltham, remain.

Eleatic School (el-ē-at'ik), a Grecian philosophical sect, so called because it originated in Elea (Latin, *Velia*), town of Magna Græcia (Southern Italy), of which also three of its most celebrated teachers, Parmenides, Zeno and Leucippus, were natives. The founder was Xenophanes of Colophon, who came to Elea late in life, bringing with him the physical theories of the Ionian school, to which he added a metaphysic. The two schools soon drifted widely apart, especially in respect of method. Starting from the observation of external nature, the Ionians endeavored to discover some elementary principle, as water, air, fire, or a combination of elements, by the action of which the phenomena they observed might be accounted for. The Eleans made the abstract idea of Being or God, deduced from the contemplation of the universe as a whole, their starting point; and their reasonings sometimes led them to deny the reality of external phenomena altogether.

Elecampane (el-i-kam-pān'; *Inŭla Helēnium*), a plant of the nat. order Compositæ, found in the United States and Europe, also in Asia. It is 3 or 4 feet high; the radical leaves are often 2 feet and more in length; the flowers are large and yellow; the root, which is perennial, possesses a bitter, camphor-like taste. It was formerly much used as a stimulant for all the secreting organs.

Election (el-ek'shun), in theology, the doctrine that God has from the beginning elected a portion of mankind to eternal life, passing by the remainder. It is founded on the literal sense of certain passages of Scripture, and has been amplified by the labors of systematic theologians into a complete and logical system. It dates in ecclesiastical history from the time of Augustine; but Calvin has stated it so strongly and clearly in his Institutes that it is generally associated with his name.

Election, in politics, the selection by voting of a person or persons to occupy some post or office. The most important elections are those of the members of the legislative assemblies of the different countries, and as to the manner in which these are carried out strict laws are in force. In such elections voting by ballot (see *Ballot*) is now general. The chief forms of election in Britain are parliamentary and municipal elections, in both of which the basis of the suffrage (or right of voting) is the payment of poor-rates. Jurisdiction of election laws of the United States extends to such officers of Federal Government as are elective, viz., the president, vice-president and members of the House of Representatives. The election

of officers of the State governments is regulated by the several State codes. The president and vice-president are elected by a college of electors, which college is composed of as many electors as there shall be senators and representatives in Congress at the time of the appointment of such electors. The people vote directly for these electors. Members of Congress are elected as follows: each State is entitled to two senators who, according to the Seventeenth Amendment, are elected directly by the people, as the members of the House of Representatives have always been. All citizens of the United States are entitled to vote except citizens of the District of Columbia. In 1870 persons of African descent were given the right to participate in elections. The States of the Union from time to time enact laws for the regulation and management of their local elections, embracing the choice of the officers of the State, city and county. The constitutions of the several States secure to citizens the right of suffrage. The laws of each State provide the means of effecting the ends of the constitution, and prescribe the qualifications of voters, which vary somewhat in the different States. The length of residence in the State previous to an election is fixed by the State law and varies in the different States from three months to two years. Traces of property qualifications linger in some of the States, and certain States make the payment of a poll tax a condition precedent to voting. Various States require the ability to read and write. In a steadily increasing number of States full suffrage is extended to women, while partial suffrage exists in many States. See *Women's Rights.*

Elector (e-lek'tur; German, *Kurfürst*, 'electoral prince'), the title of certain princes of the old German Empire who had the right of electing the emperors. There were ten in 1806, when the old empire was dissolved. Also the title given to those chosen to elect the president of the United States. (See *Election.*)

Electoral College (e-lek'tur-al), in the United States, the body of men elected in each State to cast the vote of the people of the State for presidential candidates. The State conventions of the various parties nominate the electors, one for each representative, and one for each senator in Congress. These persons are voted for on the general election day. Those elected are required to meet on the first Wednesday in December in the year in which they are elected, in such places as the legislature of each State may direct. The governor is to give them three certified lists of those chosen to be electors; the electors are to make three lists of the persons balloted for by them for the presidency and vice-presidency, and to the certified lists annex the certificates furnished by the governor. They are to appoint one of their number to carry one of the certificates to the president of the Senate before the first Wednesday in January, and to send to the president of the Senate, by mail, another copy of the certificates; and the third they are to give to the judge of the district wherein they assemble.

Electoral Commission, a commission provided for by act of Congress, January 29, 1877, to settle disputed questions in regard to the electoral votes of several States in the presidential election of 1876. It was composed of five senators, chosen by the Senate; five members of the House of Representatives, chosen by the House; and five associate justices of the supreme court, four of whom were designated by the act of Congress, and the fifth selected by the four. It was found, on counting the electoral votes in the presence of the two houses of Congress, that there were conflicting certificates from four States—Louisiana, Florida, Oregon and South Carolina. These certificates were referred to the commission, which by a vote of eight to seven—following the line of party division in the commission—decided that the certificate of electoral votes cast for Hayes and Wheeler, the Republican candidates, was the legal certificate. The decision of the commission, according to the terms of the statute, became irrevocable; the disputed votes were counted accordingly; and Hayes and Wheeler were found duly elected, by a majority of one electoral vote. The important question before the commission was whether an electoral certificate being in form confessedly according to law, it was competent for Congress or the commission to go behind the same and take evidence *aliunde* in support of alleged irregularities committed before such certificate was issued. The majority of the commission took the negative. The decision was bitterly resented by the Democratic party, which maintained that its candidates had been rightfully elected and had been deprived of their just rights.

Electric Battery (e-lek'trik), the original name of what is now more commonly called a battery of Leyden jars, the old name hav-

ing been given before galvanic batteries were invented. See *Leyden jar.*

Electric Chair, an apparatus used in performing an electrocution. It consists of a strong chair, to which are attached straps for holding the body of the subject in position and electrodes through which the heavy electric current used to extinguish life passes.

Electric Clock, a clock driven or controlled by electricity, the latter being the ordinary meaning of the term. One clock driven in the ordinary way can be made to control by electric currents another clock (or clocks) also driven in the ordinary way so as to make it keep accurate time. The method of R. L. Jones, more or less modified, is now in very extensive use. By means of it one high-class clock (usually in an astronomical observatory) compels a number of other clocks at considerable distances to keep time with it. The clocks thus controlled ought to be so regulated that if left to themselves they would always gain a little, but not more than a few minutes per day. The pendulum of the controlling clock, in swinging to either side, makes a brief contact, which completes the circuit of a galvanic battery, and thus sends a current to the controlled clock. The currents pass through a coil in the bob of the pendulum of the controlled clock, and the action between these currents and a pair of fixed magnets urges the pendulum to one side and to the other alternately. The effect is that, though the controlled clock may permanently continue to be a fraction of a second in advance of the controlling clock, it can never be so much as half a second in advance. An electrically controlled clock usually contains a small magnetic needle, which shows from which direction the currents are coming. The arrangements are usually such that at every sixtieth second no current is sent, and the needle stands still. Any small error is thus at once detected. The term is also frequently applied to clocks containing a small battery which are self winding.

Electric Car. See *Trolley.*

Electric Eel (*Gymnōtus*), an eel abundant in the fresh waters of Brazil and the Guianas, which possesses organs capable of developing a strong electric current and thus of giving a violent shock to any one touching the eels. These organs replace the lower muscles along the sides of the tail. The eels can be taken by driving horses into the water to be shocked and seizing them when thus weakened. Other electric fishes are *Torpedo*, or electric ray, and the African catfish. The origin and mode of operation of these organs are unknown.

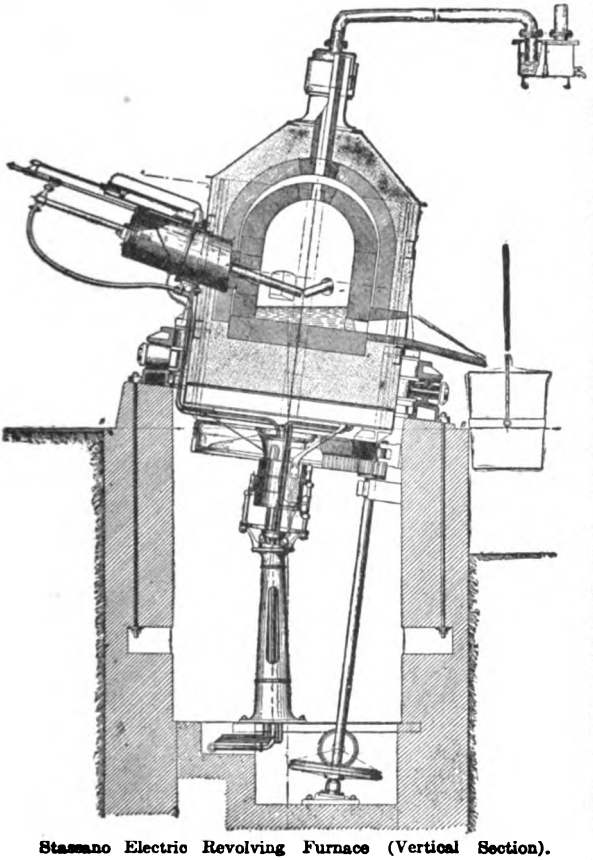
Electric Furnace, a device or receptacle in which a high temperature is produced by means of the electric current for the purpose of effecting a chemical reaction or change of state in the substance to be treated, such as the reduction of an ore, the formation or breaking down of a compound, or the fusion or volatilization of a metal or compound. Since the heat developed in any given portion of an electric circuit is proportionate to the resistance offered to the passage of the current, that portion of the circuit which is outside the furnace is composed of metals such as copper or aluminium, while the resistance of the portion or portions of the circuit in which it is desired to localize the heat is relatively high. There are three forms of electric furnace, the chief points of difference being in the character of that portion of the circuit in which the heat is desired.

The Arc Furnace.—The first consists of an arc, in which the incandescent gases produce an extreme degree of heat between carbon terminals. With this type of furnace it is possible to produce a temperature of 4500 degrees centigrade in a small furnace charge. Since it is impossible to place more than a small quantity of the charge within the arc it is necessary in commercial work either to establish a number of arcs or move the arcs relatively to the charge or move the charge relatively to the arcs. The high temperatures made possible by the use of the electric furnace have opened a new field to chemistry, but careful regulation of the heat is essential. This may be obtained by moving the charge or moving the arc, adjusting the duration of contact to the quantity of the charge. Generally speaking, the arc is both wasteful and inefficient as a source of heat.

The Electrolytic Furnace.—A molten salt may not only be kept in a state of fusion by the heat developed by its own resistance to the passage of a direct current of sufficient volume, but it will be 'electrolyzed' or decomposed so that one of its parts, which may be a metal, will accumulate at the positive electrode known as the 'cathode' and another part will accumulate at the negative electrode or 'anode.' This process is extremely useful in breaking down certain compounds, but the heat regulation must be very exact.

The Incandescent Furnace.—This term is used to designate furnaces in which

the heat is developed by the passage of the current through a body which is solid initially, such as a core of carbon; a granular bed of coke; retort carbon or graphite; the charge itself when mixed with carbon; or a pyro-electrolyte, an oxide which becomes capable at high temperatures of carrying the current. In a furnace of this type it is possible to obtain a very accurate adjustment of the temperature by the regulation of the current applied.

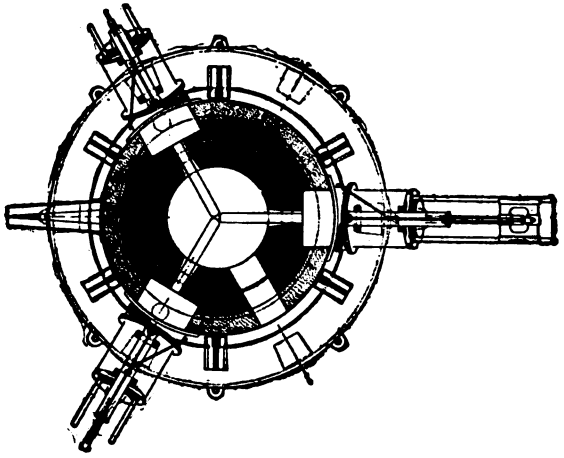


Stassano Electric Revolving Furnace (Vertical Section).

Electricity (e-lek-tris'i-ti), the name given to the unknown cause of certain effects of varied kinds which are found to be closely connected one with another. They include two distinct kinds of attraction and repulsion (*electrostatic* and *electrodynamic*), the magnetization of iron, the deflection of magnetic needles, the production of heat and light in certain circumstances, the separation of certain chemical compounds into their constituents, and spasmodic actions on the nervous and muscular systems of animals. The name is derived from the Greek *ēlectron*, amber, the fact that amber when rubbed attracts light particles, such as small pieces of paper, having been known to the ancient Greeks. Friction was the only artificial source of electricity employed until Galvani, near the close of the eighteenth century, accidentally obtained it by the contact of two metals with the limbs of a frog; and Volta, developing Galvani's discovery, invented the first galvanic or voltaic battery. Electricity produced by friction is called *frictional electricity*; that produced by chemical action on metals, *voltaic electricity*.

Conductors and Non-conductors.—All substances which, like amber, could be made to show electrical attraction by rubbing them, were called *electrics* by early writers on electricity. They included glass, amber, sulphur, shellac, rosin, silk, flannel, etc. The name *non-electrics* was given to other bodies which were supposed not to be susceptible of excitation by friction. The bodies called non-electrics were also called *conductors*, from the power which they exhibited of allowing electricity to pass through them, while electrics were called *non-conductors*. The names conductor and non-conductor are still retained, but the names electric and non-electric are discarded as being founded on a mistake. Electricity can be excited by the friction of a conductor against a non-conductor, and is, in fact, so excited in the ordinary electrical machine, in which glass rubs against an amalgam spread on a cushion. (See *Electric Machine*.) A metallic rod furnished with a glass handle can be electrified by rubbing it with flannel, the glass

preventing the electricity from being conducted away through the hand. Substances thus electrified exhibit two opposite kinds of electricity, known, respectively, as *positive* and *negative*. Bodies charged with the same kind of electricity repel each other; those charged with opposite kinds attract each other. An instrument for indicating the presence of electricity is called an *electroscope* (which see).



Stassano Electric Revolving Furnace (Horisontal Section).

Electric Conduction.—All solid and liquid substances allow electricity to pass through them to some extent, but the differences of degree are enormous. The best conductors are the metals, especially gold, silver and copper. Perfectly pure copper conducts about seven times as well as iron. Substances which have extremely small conducting power are not called conductors, but *insulators*, so that a good insulator is another name for an extremely bad conductor. Among the best insulators may be mentioned glass, paraffin (the wax, not the oil), ebonite, shellac, mica, India rubber and gutta percha. The ratio of the conducting power of a metal to that of one of these substances is about a thousand million billions to one. Water occupies an intermediate position between these two extremes. In experiments with frictional or influence machines it behaves as a conductor, but in experiments with galvanic batteries, it behaves as an insulator. The word *resistance* is used in the opposite sense to conducting power: a good insulator is said to have high resistance, and a good conductor to have low resistance.

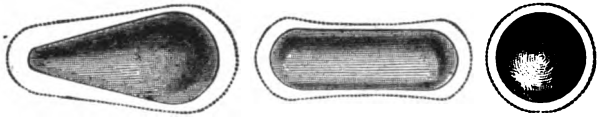
Electrostatics is that branch of the general science of electricity which treats of the repulsions between like and the attractions between unlike kinds of electricity. The fundamental law of electrostatics is that if e and e' denote two quantities of electricity collected in two spaces very small in comparison with the distance between them, the mutual force which they exert upon each other is directly as the product $e\ e'$, and inversely as the square of the distance. If the two quantities e e' are both positive or both negative, the force is a repulsion; but if one is positive and the other negative, it is an attraction. Electrostatic attractions and repulsions manifest themselves in two distinct ways, namely, (1) as attractions and repulsions between electrified bodies; (2) as producing changes in the distribution of electricity on conductors. This second effect is called *electrostatic induction*. The different portions of the charge of one and the same conductor act upon one another according to the general law of repulsion, and thus produce the actual distribution, which is entirely on the surface, all electricity being repelled from the interior. The interposition of an insulating substance between two quantities of electricity alters the amount of the forces which they exert upon each other. In a broad sense electrostatics may be held to include within its range all the phenomena of frictional electricity and of the electricity produced by influence machines, such as those of Holtz, Voss and Wimshurst. (See *Electric Machine*.)

Electric Discharge.—The rapid escape of electricity from a charged body is an electric discharge. When the discharge takes place through a conductor it is called *continuous*, and when it takes place through a non-conductor (for example through air) it is called a *disruptive discharge*. The name 'electric discharge' is especially applied to cases in which the escaping electricity produces luminosity. Three kinds of such discharge have been distinguished—the *spark*, the *brush* and the *glow*. The spark is accompanied by a sound which varies from a faint crack to a loud bang. In nature

it is seen on the largest scale in the case of lightning, which is a discharge of atmospheric electricity. In many cases the electric spark presents no definite shape, but looks like a mere point of fire, or, if very bright, is enlarged by its dazzling effect on the retina; but when it leaps across a space of several inches of air it assumes a crooked shape bearing a remarkable resemblance to a flash of lightning. The *brush* discharge is only faintly luminous. It occurs especially at sharp points and edges of highly charged bodies. It is barely visible by daylight, and its appearance in the dark is that of a luminous halo. It projects only a small distance into the air surrounding the body from which the charge is escaping. The *glow* discharge simply renders the surface of the body luminous, and does not extend into the air at all. In some modern electric apparatus beautiful effects of electric discharge are shown. Thus by causing a discharge to take place in highly rarefied air or gas it is made to jump across a considerable interval, and the whole intervening space is filled with a beautiful nebulous luminosity, the color of which depends on the nature of the gas. If the vacuum is sufficiently good the luminosity is seen to be disposed in transverse stripes, technically called *striæ*.

Dissipation of Electricity.—An electrified body left to itself gradually loses its electricity. This effect is due to more causes than one. If the body is a conductor and has any sharp points or edges, these afford a ready channel for the escape of the charge into the air. Some loss occurs by particles of dust in the air being attracted to the body and then repelled after coming in contact with it. But the chief loss in the case of a smooth conductor on insulating supports usually occurs by leakage over the surface of the supports, owing to a thin film of moisture from which it is difficult to keep them free. This is especially the case with glass supports. Dissipation can be almost completely prevented by surrounding the electrified body with an artificially dried atmosphere. The usual means of doing this is to place a shallow dish of sulphuric acid or calcium chloride in the closed vessel in which the body is contained. The loss by dissipation can thus be reduced to one or two per cent. of the entire charge per diem.

Distribution of Electricity.—When a conductor has a permanent charge, there is no electricity in its interior. The charge resides entirely at the surface, and is not *distributed* equally over the whole surface, but is thickest (so to speak) at those parts which project most. The dotted lines in the figures below illustrate, by their distances from the conductor, the thickness (technically called *density*) of the electricity at the different parts of the surface. At sharp edges, and still more at sharp points, the density is exceedingly great, and hence, owing to this density, the electricity has a strong tendency to leak away.



Distribution of Electricity—Relative Amounts on Curved Surfaces.

Electric Currents.—What is known as an electric current is a peculiar condition of a wire or other conductor of electricity, in virtue of which it deflects magnetic needles in its neighborhood, magnetizes a piece of soft iron round which it is coiled, has its own temperature raised, and exhibits various other effects. This condition of a wire occurs both in connection with frictional and voltaic electricity, and can be produced by attaching its ends to the two terminals of a galvanic battery, or to the two terminals of a magneto-electric machine, and in various other ways. An electric current may be regarded at pleasure as consisting in the flow of positive electricity in one direction through the wire in question, or of negative electricity in the opposite direction, or of both electricities simultaneously one in each direction. What is conventionally called the direction of the current is the direction in which the positive electricity may be regarded as flowing. The 'strength' of a current denotes the quantity of electricity that passes through the wire in the unit of time. The deflecting force which a current exerts on a magnetic needle—other things being equal—is proportional to the strength of a current; but the quantity of heat which it generates in a given time is proportional to the square of its strength. One effect of currents is the decomposition of certain chemical compounds (see *Electrolysis*), and this effect, like that first mentioned, is simply proportional to the strength of the current. Instruments for measuring the strengths of currents by chemical decomposition are called *voltameters*, and instruments for measuring

them by the deflection of magnetic needles are called *galvanometers*. (See these articles.) The currents by which telegraphs are worked are usually obtained from galvanic batteries; but the far stronger currents required for electric lighting are usually produced by machines called *dynamos* driven by steam or water power. (See *Dynamo*.) The currents in such machines are due to magneto-electric induction. (See *Induction*.)

Electrodynamics is that branch of electrical science which treats of the attractions and repulsions exhibited between wires or other conductors through which currents are passing. If two wires are parallel, they will attract each other when currents are passing the same way through them both, and will repel each other when the currents are opposite. If the wires are inclined to each other at any angle, there is not only an attraction or repulsion, but a still more marked tendency to rotation, which is not satisfied till the wires have become parallel and the currents flow in the same direction through them both. When there are only two straight wires these forces are feeble, and require delicate apparatus for their exhibition; but by employing coils of wire the forces are multiplied, and an instrument constructed on this principle called the *electrodynamometer* (which see) has been much employed for the measurement of currents. The whole science of electrodynamics is due to Ampère, who discovered its main facts, and reduced them by ingenious experiments, combined with very abstruse reasoning, to a single mathematical formula which includes them all.

Velocity of Electricity.—Daily experience with the electric telegraph shows that electrical action is propagated with great rapidity. The time that intervenes between the sending of a signal from one station and its visible effect at another depends on a variety of circumstances. The time is notably longer for underground or submarine wires than for wires suspended in the air on poles. When one end of a long submarine or subterranean telegraph wire is suddenly put in connection with a galvanic battery or other source of electricity, the current which flows out of the other end into the earth does not begin sharply but gradually, and takes a measurable time to attain its full strength. Hence an instrument which is delicate enough to react to a very feeble current will show the effect earlier than one which requires a strong current to move it. An instrument in which the moving parts are small and light has also an advantage over one in which they are large and heavy. Something, too, depends on the nature of the source of electricity employed. A source which acts with sudden violence, like the discharge of a Leyden jar or an induction coil, will make the effect appear earlier than a comparatively gentle source, such as an ordinary galvanic battery. Electricity has not a definite velocity like light or sound. It is rather comparable to waves on water, which travel with very various speeds according to their length and the depth of the water. The highest speed ever observed in the transmission of electric effects was that obtained by Wheatstone in his celebrated experiment with a rotating mirror. In this experiment a Leyden jar was discharged through half a mile of wire with three interruptions in it, at each of which a spark was formed by the electricity leaping across. One interruption was in the middle, and the other two were at the ends, one end being close to the knob of the jar, and the other end close to its outer coating. The wire was so arranged that all three interruptions were near together; and by observing the reflections of the three sparks in a rotating mirror, he was able to discover that the middle spark occurred sensibly later than those at the two ends, these latter being simultaneous. The lagging of the middle spark behind the other two was regarded as the time that electricity took to travel through a quarter of a mile of wire, and the velocity thus found for electricity was 230,000 miles per second, a velocity greater than that of light, which is between 185,000 and 186,000 miles per second. Observations made in connection with the use of the electric telegraph for determining longitudes have shown that the time which intervenes between the sending and receiving of a signal was about four-tenths of a second between Aden and Bombay, two-tenths of a second between Alexandria and Malta, two-tenths between Malta and Berlin, and about one-eighth of a second between Greenwich and Valentia.

Electrical Theories.—If we endeavor to explain electrical phenomena by regarding electricity as a substance, we are met by two difficulties: one is that electricity adds nothing to the weight of a body; the other is that electrical phenomena are dual, as if there were two opposite kinds of electricity which destroy each other when they unite. Du Faye maintained the existence of two electrical fluids endowed with opposite qualities, and called them the *vitreous* and the *resinous* fluid. Franklin en-

deavored to account for the same phenomena by assuming the existence of a single electric fluid, and supposing an electrified body to be a body which possesses either more or less than the normal quantity of this fluid. If more, it was said to be positively, and if less, negatively electrified. Franklin's *positive* and *negative* correspond with Du Faye's *vitreous* and *resinous*. Whenever electricity is generated the two opposite kinds are always produced, and produced in exactly equal quantity. Modern theories favor the idea that electricity is not a substance or a pair of substances, but a special kind of motion, and that the two opposite electricities are two opposite states of motion of the particles of a medium which is believed to pervade all bodies and all space; the same medium whose vibrations constitute light.

Applications of Electricity.—The various methods of employing the electric current have become enormously important in commerce and industry. The telegraph and telephone rapidly follow civilization to every part of the globe. Recent developments in electric lighting and heating, together with the wide range of adaptability of the electric current as a source of power, due to its flexibility and economy, make it a factor of great and rapidly increasing importance throughout all civilization. The electrical operation of railways has been enormously developed and it seems only a matter of a few years until all trains will be moved by this motive power. The use of electricity in chemistry and metallurgy has led to many important discoveries and new processes in manufacturing. (See separate articles.)

The Electric Transmission of Power is effected by employing the source of power to drive a machine called a *dynamo* which generates an electric current. This current is conveyed by a copper conductor insulated from the earth to the distant station, where it passes through a machine called an *electromotor*, one part of which is thereby made to revolve, and imparts its motion to the machinery which is to be driven. (See *Dynamo* and *Electromotor.*)

This is the simplest arrangement, and is that which is commonly employed when the original currents are not of such high tension as to be dangerous to life in the case of accidental shocks. There is, however, a great waste of power in employing low-tension currents when the distance is great; hence it is becoming a common practice to employ high-tension currents for transmission through the long conductor which connects the two stations, and to convert these into low-tension currents before they reach the houses or workshops where they are to be used. This is done sometimes by employing the high-tension currents to drive a local dynamo which generates low-tension currents. The discovery that a Gramme machine is reversible—that is to say, when two Gramme machines are coupled together and one is operated as a generator, the other will act as a motor—was an important step taken in the transmission of power. Numerous efforts, since then, have been made to utilize electricity for the transmission of power over a long range. For this purpose the alternating current seems eminently adapted as transformers only are needed to raise the line to high transmission voltage and to lower it again for use. The possibilities offered by electrical transmission of water-power for sections of country favored with waterfalls are numerous and have been extensively developed, which should result in making them great industrial centers. In this direction much has been done in utilizing the immense power of the Niagara Falls by electrical transmission, works having been built for this purpose both in New York and Canada, and several hundred thousand horse-power developed. The application of the power of waterfalls to the generation of electricity is rapidly extending, and promises to become a great source of mechanical power in the future.

The phrase, '*distribution of electricity*,' has been used during the last few years to denote the supplying of strong currents of electricity from central stations, where they are generated, to houses, street lamps, etc., in their vicinity. The central station contains a few powerful dynamo machines, driven usually by steam-power. The positive and negative terminals of the dynamo are put in connection with the positive and negative main conductors which are to supply the district, and from these mains smaller conductors branch off to the houses or lamps. All these conductors are of copper, that metal when pure having seven times the conductivity of iron. Different methods are in use for keeping the supply of electricity steady in spite of the varying demands made upon it. In some systems of distribution, instead of the two main conductors being one positive and the other negative, each is positive and negative alternately, the reversals taking place some hundreds of times per second. The currents are then said to be *alternating*. When such reversals do not take place, the currents are said to be *direct*.

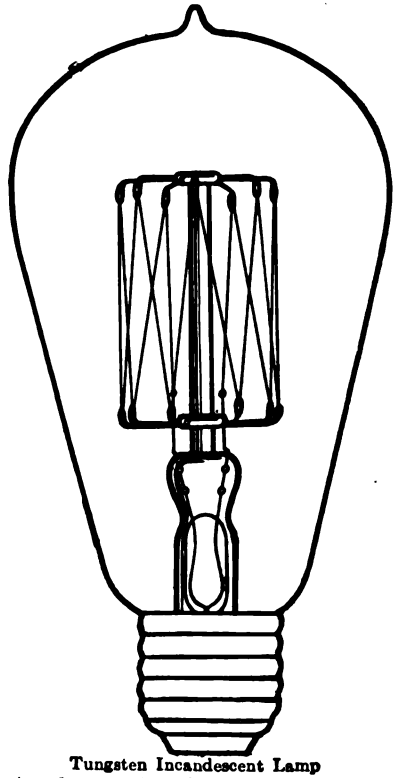
Electric Light (e-lek'trik), a light obtained through heating a suitable body to incandescence by causing a current of electricity to pass through the body. The substance usually employed for this purpose is carbon, which has two recommendations: first, its power of bearing a very high temperature without melting; and, secondly, its high emissive power, which is the source of most of the light in the flame of a candle, an oil lamp, or a jet of gas.

Until within recent years the only kind of electric lamps in practical use was what is now called the *arc* lamp. The arc light is obtained by causing two sticks of carbon, one of them in connection with the positive and the other with the negative terminal of a battery or dynamo, to touch each other for an instant so as to complete the circuit, and then separating them and keeping them steadily at a small distance apart. Before the carbons have touched, the cold air between them prevents the current from passing, but as soon as they touch they become intensely heated and if they are not separated too far the air between them is hot enough to serve as a conductor. The light is emitted partly by the ends of the carbons, especially of the positive carbon, and partly by the gaseous matter (containing also fine particles of solid carbon) which occupies the intervening space and forms the *arc* or streak of light joining the two carbon points. When the source of electricity is an alternating current machine, each carbon is alternately positive and negative many times in a second, and the two points behave alike. When the source is a direct current machine or a galvanic battery the positive carbon wears away about twice as fast as the negative, and the positive carbon becomes hollow at the end, while the negative remains pointed. The hollow in the positive carbon is the brightest part of the whole arrangement; and when a beam of light is to be thrown in some definite direction, care should be taken that this hollow is exposed to view in that direction.

Fig. 1.—Arc Lamp Carbons.

Fig. 1 contains a representation of the two carbons of the arc lamp as they appear when cold, the positive carbon being marked + and the negative —. Also a magnified representation such as can be obtained by throwing an image of the burning carbons on a screen by means of a lens.

To keep the carbons at the proper distance apart a special contrivance called a 'regulator' is employed. There are many varieties of regulator, but they all depend on the principle that increase of distance between the carbons causes increase of resistance. They usually contain an electro-magnet through which either the whole or a portion of the current passes, and the variations in the strength of this magnet arising from change of resistance are taken advantage of to cause the motion, in one direction or the opposite, of a piece of iron which locks and unlocks the mechanism.



Tungsten Incandescent Lamp

Arc lamps give the largest amount of light for a given amount of horse-power expended; but incandescent lamps, pos-

sess several advantages. Owing to the absence of oxygen, there is no combustion in an incandescent lamp, and hence the carbon does not waste away. The want of means to obtain a sufficiently good vacuum was the chief cause which prevented the earlier introduction of such lamps. Sprengel's mercurial pump, with Crookes' improvements, has supplied this want. All the incandescent lamps agree in having a filament suspended *in vacuo*, but they differ in the material and mode of preparation of the filaments and in other details. A great improvement came with the invention of the tantalum incandescent lamp in 1904. There are certain metals known to have a melting point upwards of 2000° C. and of these tantalum is one. By using this metal for the filament a gain in efficiency of over one watt per candle-power is secured. Filaments of molybdenum and tungsten are also used. the latter with good success and are capable of giving light with a useful commercial life at an efficiency of about one watt per candle-power.

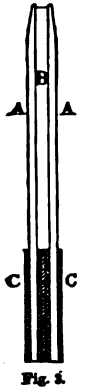
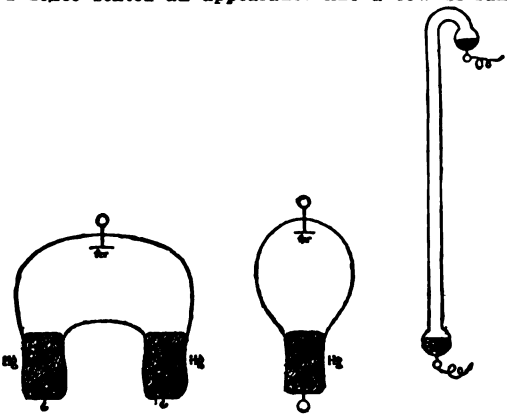


Fig. 1.

The light of an incandescent lamp is extremely steady, affording a great contrast to the flickering which is never altogether absent from arc lights. Its temperature is lower, and hence its color is not blue or violet, like that of most arc lights, but slightly yellow, though whiter than gas. It is superior both to gas and to the arc light in giving off no products of combustion to vitiate the air of an apartment.

The Jablochkoff light, which is represented in Fig. 3, occupies an intermediate place, but more nearly resembles the arc lamps. The two sticks of carbon (A A) are side by side at distance of ¼ inch or ⅛ inch. The lower ends of the carbons are inserted in copper or brass tubes (C C).

The introduction of electric lights for commercial uses may be said to date from the lighting of the Avenue de l'Opéra at Paris by Jablochkoff lamps, a few years previous to the Paris Electrical Exhibition of 1881. The electric light, as previously known, was considered too dazzling for street purposes, but the Jablochkoff 'candles,' which even when naked are far less dazzling than 'arc' lights, were concealed from direct view by opal globes, and instead of single points of dazzling brightness presented an appearance like a row of full moons. A novel form of electric light known as the *Hewitt Mercury Vapor Lamp* was invented by Peter Cooper Hewitt of New York, in 1902. It is the only form of artificial light in practical use which does not depend on the incandescence of a solid substance—usually carbon—for its lighting property. The mercury vapor lamp, as its name suggests, derives its light from the gas or vapor of mercury in which the passage of an electric current causes a high state of incandescence. The lamp consists of a glass tube partially filled with mercury, in each end of which is sealed a metal conductor. The tubes are exhausted to a high degree by a vacuum pump before sealing to prevent any escape of the vapor. In operation, after the current is turned on, the tube is tilted until the mercury connects both conductors. The passage of the current vaporizes the mercury and the vapor becomes incandescent, producing a powerful greenish light superior to the arc light, in places where considerable illumination is required, because of its freedom from shadows and from the annoying flicker of the arc light. It is widely used in industrial establishments because of its low cost per candle power. It is also of great value in photography, since the light is widely diffused and is composed of the 'actinic' or chemically active rays, making it a perfect substitute for daylight. Inventive ingenuity has been largely extended upon the details of electric lighting, as the records of the Patent Office will testify—for cutouts, arc-


Mercury Lamps.

lamp regulators, sockets and keys, dynamo regulation, systems of distribution, etc. The generator has attained an unrivaled degree of perfection, almost 95 per cent. of the power obtained being yielded as electric energy. The continuous current-dynamo is now a work of art. The various steps of its construction are operations of peculiar skill. The electric light has been applied to a great many special uses; for instance, in dentistry and surgery the incandescent lamp is used to explore hidden recesses of the human frame, and on ships the arc lamp as a searchlight. In submarine work electric lighting has proven of great value. Street lighting with arc lamps has had an enormous development and nearly all towns of any progress in the United States have their streets electrically lighted. The extraordinary development in the application of alternating currents is specially notable. This system of lighting has spread with such rapidity that it is now in general use all over the United States. The meter has received its due share of attention from the unwearying inventor, more than 200 patents, from the United States Patent Office, having been issued for direct and alternating currents.

Electric Machine, any machine for producing powerful electrical effects. The name is, however, seldom applied to machines depending on magneto-electric principles, and is practically confined to two classes

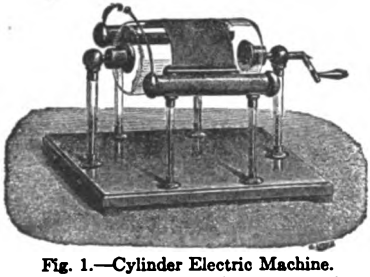


Fig. 1.—Cylinder Electric Machine.

of machines—those which act by friction, and those which act by electrostatic induction. The former are called friction machines, and the latter influence machines. For many years the former were the only kind known, but they have now been almost superseded by the latter. In friction machines the electricity is generated by the friction of either a glass cylinder of a circular glass plate against cushions covered with an amalgam of zinc and tin. The positive electricity which is thus developed on the surface of the glass is given off to an insulated brass conductor furnished with teeth like those of a comb, the sharp points of which are nearly in contact with the glass. The negative electricity which is at the same time generated on the cushion must be provided with some means of escaping, or the action of the machine would soon stop. It is usually allowed to escape to the earth by a brass chain connected with the cushions; but in some machines a negative conductor connected with the cushions is insulated like the positive conductor by a glass support. Negative sparks can then be drawn from this conductor at the same time that positive sparks are drawn from the other. A cylinder machine having both a positive and a negative conductor is shown in Fig. 1, and a plate machine in Fig. 2.

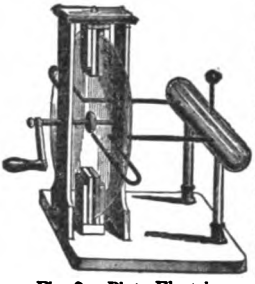


Fig. 2.—Plate Electric Machine.

An influence machine (that of Voss) is exhibited in Fig. 3. Of the two glass plates which it contains, the larger is stationary, and has two patches of tinfoil on its back, one of which has a positive and the other a negative charge. One of them covers the left hand and

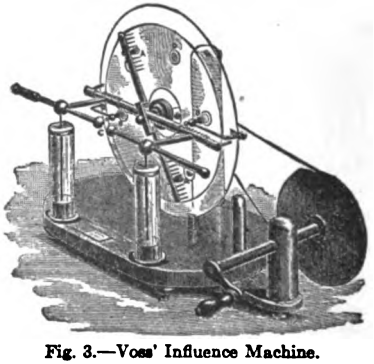


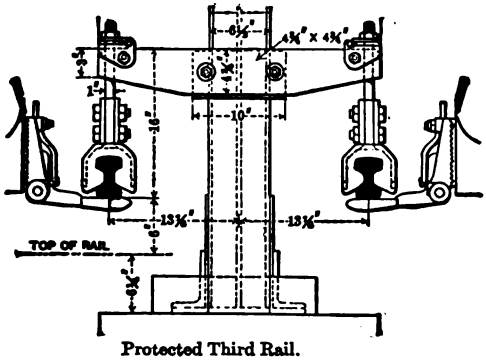
Fig. 3.—Voss' Influence Machine.

upper portion of the back, and the other the right hand and lower portion. The revolving plate has six metallic studs like that seen at D set in it at equal distances. The sloping bar seen in front of it is of brass and carries two little

brushes, A A, of thin brass wire, against which the studs rub as they pass by, and this happens at the same moment for both brushes. When the studs have advanced about a quarter of a revolution, they come in contact with another pair of brushes, B B, which are in connection with the two patches of tinfoil, and serve to replenish their charges.

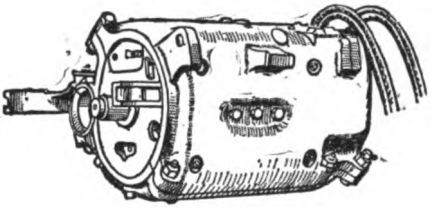
There are also two brass combs fixed opposite the two horizontal radii of the plate, one row collecting positive and the other negative electricity. They are in connection with the two knobs, C, and a brilliant discharge of electricity takes place between these knobs. The first influence machine that came into extensive use was that of Holtz, and the latest (and probably the best) is that of Wimshurst, in which both the plates revolve, their directions of rotation being opposite. The machine of Holtz is started by holding a flat piece of vulcanite, which has been excited by friction, at the back of the fixed plate. The machines of Voss and Wimshurst, if kept dry, will usually work without such assistance, their action being such as rapidly to increase any casual charge possessed by the plates. For other kinds of machine by which electric shocks can be obtained, see *Electro-medical Machines.*

Electric Railway. The enormous development of the electric railway in the United States can be appreciated from the fact that



Protected Third Rail.

there are now in operation in this country many thousands of railways, nearly all of which are moved by electric power. These are not only surface roads, there being also many miles of elevated and subway track. They have spread rapidly through every section, and have shown themselves fully able to handle travel in the busiest city as well as in the rural district. The overhead system of supply, from its cheapness of equipment and reliability, commends itself most emphatically to operators of street cars. The voltage generally employed is less than 500, and it has been repeatedly shown that from such an electromotive force no danger to human life can result. In New York city, where the law forbids



Direct Current Iron-clad Railway Motor.

the employment of the overhead system, an underground system has been adopted, the wires being carried through conduits. For subway, elevated and high speed interurban electric railways, the third rail supply system, is preferred, as the contact shoe forms a better conductor for the powerful currents necessary to operate heavy trains than a trolley wheel. In many localities the steam railroad has been paralleled by electric railroads. In this direction the use of electricity is rapidly growing, and the indications are that it will eventually largely or wholly replace steam as a propelling agent. The storage-battery system of applying electric power has been experimented with, and a new one, invented by Edison, is promising.

Electric Storage Battery, the term applied to an unstable chemical compound, which, in its change to a more stable condition, emits electric energy. In this protoxide of lead is usually employed. In charging a storage cell a dilute acid, with lead electrodes, is employed. When a current of sufficient strength is sent through this the positive electrode becomes covered with peroxide of lead, while spongy lead gathers on the negative electrode. After the cell is fully charged in this way, it acts like a galvanic cell of low resistance and considerable electromotive force. If the circuit be now closed a reverse chemical effect takes place, the peroxide of lead becoming reduced to the protoxide, while the spongy lead is oxidized, electric energy being given off as a consequence of the chemical change. When this is com-

pleted the cell may be recharged as before, when it is ready to repeat the same process. As part of the recent development in electric lighting the efficiency of accumulators or storage batteries has been greatly increased, they being now largely used as a source of electric power. The need of some such direct source of electric energy, for the movement of trolley cars and automobiles, has led to much experiment with storage batteries, which have come into considerable use as power agents, central stations for re-storage of the battery cells being provided. The weight of the cells is against them and Edison has recently been experimenting with the view of overcoming this defect. As a result, he has produced a storage battery of small size and weight and one capable of being very quickly charged. In this lead is replaced by iron and nickel, the negative pole being oxide of iron, the positive oxide of nickel. It is stated that a battery can be charged in a very few minutes which will run a trolley car for several hours. About 160 cells are needed to run an automobile or a trolley car, but the weight is much less than that of the lead batteries.

Electro-chemistry, the branch of chemistry in which the reactions that occur are either directly or indirectly due to electrical agencies. Among the direct applications of the electric current may be noted: the action of gases which ordinarily show no tendency to combine with each other often will do so readily under certain conditions of electrical influence; electrolysis of dissolved salts has proved of great value in the commercial production of chemical substances (see *article*), practically all the commercially pure copper and aluminium produced being refined by this process as well as the following: Caustic soda, bleaching powder, barium hydrate, coal-tar dyes, pure iron and many others. The electric furnace (see article) furnishes an example of the indirect method of utilizing the electric current in the manufacture of chemical substances. The application is indirect because the current does not perform the chemical work, but merely serves to produce the high temperatures necessary to bring about the chemical reactions desired. As an instance of the importance of this industry it may be noted that the annual output of electro-chemical products in the United States alone exceeds $100,000,000. (See also *Electro-Metallurgy.*)

Electrocution (e-lek-trō-kū'shun), a word indicating execution by electricity, a powerful current being passed through the body of the criminal. Electrocution is practiced in many of the United States.

Electrode, the term applied to either of the terminals of an electric source of supply.

Electro-dynamometer, an instrument used for the measurement of electric currents by means of the mechanical forces which they exert upon each other. It contains two coils of wire, one fixed and the other movable; the latter being either larger or smaller than the other so as to be able to pass either outside it or through it. Both coils are in vertical planes and have the same vertical diameter, round which the movable one can revolve so as to set its own plane at any angle with the plane of the other. The terminals of the movable coil dip in cups of mercury, one of which is in connection with one end of the fixed coil, and the other with one of the binding screws of the instrument. The other binding screw is in connection with the other end of the fixed coil. Hence when the two binding screws are connected with a battery or other source of electricity, the current has to pass through both coils. Its effect is exhibited by a tendency in the movable coil to set its plane in coincidence with that of the fixed coil, and in such a manner that the current will circulate the same way round both coils. This tendency is resisted by mechanical means provided for the purpose—usually by the torsion of a wire from the end of which the movable coil hangs and the measurement is usually made by applying torsion until the planes of the two coils are at right angles. The amount of torsion thus applied is proportional to the mutual forces exerted by the two coils.

Electrolysis (e-lek-trol'i-sis; Greek, *lysis*, loosening) is the chemical decomposition of certain compound bodies under the action of a current of electricity. The following are the main facts to be mentioned. When an *electrolyte* (as a body capable of electrolytic decomposition is called) is subjected to a current of electricity of sufficient intensity, it is broken up into two elements, which appear one of them at one electrode and the other at the other electrode; thus, if two platinum plates connected with the first and last plates of a battery be plunged in a trough containing a solution of chloride of silver, the chlorine is given off at the plate by which positive electricity enters—that is, at the plate which is connected with the copper plate of the battery—and the

silver is deposited at the plate connected with the zinc plate of the battery. The two elements are liberated at these places in quantities chemically equivalent. Thus for every 108 grammes of silver deposited at one side of the vessel 35.5 grammes of chlorine are given off at the other side. When a compound consisting of a metallic and a non-metallic part is decomposed the non-metallic part is set free at the electrode at which the current enters and the metallic part at the opposite electrode. Hydrogen acts as a metal. Electrolysis takes place only when the electrolyte is in a liquid state, and involves a transfer of the materials of which the compound is composed from one part of the vessel to another. (See *Electro-metallurgy.*)

The electrolytic action of the current is the same at all parts of the circuit. If the current is made to traverse several vessels, each containing the same substance, all *in series* (that is, the current that leaves the first entering the second, and so on), it will be found that in each of the cells precisely the same amount of decomposition goes on. There will be the same weight of silver deposited at one side, and the same weight of chlorine set free at the other.

The same quantity of electricity decomposes chemically equivalent quantities of different electrolytes. If we pass the current through a series of cells containing different electrolytes, for example, water, chloride of silver, sulphate of soda, and collect the products of decomposition we find that the quantities of hydrogen, silver and sodium set free are strictly proportional to the chemical equivalents of these bodies. Further, in the battery which gives rise to the electric current, if precautions are taken to avoid disturbance by local action on the plates, it is found that the action which goes on in each of its cells is chemically equivalent to that in each of the decomposing cells.

The quantity of the electrolyte decomposed in a given time is proportional to the strength of the current. Currents are often measured in practice by observing the weight of copper deposited in a given time from a solution of sulphate of copper.

Electrolyte (e-lek'trō-līt). See previous article.

Electro-magnet, a piece of iron temporarily converted into a magnet by means of a current of electricity sent through a wire which is coiled round it. The wire is usually covered with silk, cotton, gutta percha, or some other insulator, to prevent the current from leaping across, and compel it to travel through the whole length of the wire. The more pure and soft the iron is, the stronger will its magnetism be while it lasts, and the more completely will it disappear when the current stops. Steel is less affected than soft iron for the time, but remains permanently magnetized after the current ceases. Electro-magnets are usually much more powerful than other magnets of the same size. The iron which is magnetized by the current passing around it is called the *core.* It is frequently straight, the wire being wound upon it like thread upon a reel; but very frequently it has the shape of a U or horseshoe, the wire being coiled round the two ends and the bend of the U left uncovered.

To predict which end will be the north pole, the following rule may be employed: Let the core be a straight bar of iron held in front of you pointing left and right, then if the current ascends on the side next you, and descends on the further side, the north pole is to your left hand and the south pole to your right. If the straight bar is then bent into horseshoe shape, its poles will not be changed. There is no necessity to inquire whether the wire forms a right-handed or a left-handed helix, this circumstance having no influence on the question of poles. Indeed, in most cases (just as in the case of thread on a reel) the helices are some right-handed and some left-handed.

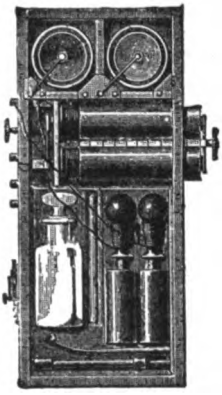
An electro-magnet is said to be *made* when the current is sent through its coil, and *unmade* when the current is stopped. In some applications of electro-magnets it is necessary to make and unmake them in rapid succession. It is then preferable for the core to consist of a bundle of iron wires rather than of a solid bar.

Electro-magnetism, a term that in its broadest sense denotes the science which treats of the relations between magnetism and electricity. In a narrower sense a magnetic effect produced by electricity is said to be *electro-magnetic,* while an electrical effect produced by the agency of magnets is called *magneto-electric.* In the preceding article we have described one electro-magnetic effect—the making of an electro-magnet by means of a current. Another important electro-magnetic effect is the deflection of a magnetic needle by a current of electricity passing near it. The simplest experiment to illustrate this action is to take an ordinary mariner's compass, hold just above it a copper wire parallel to the needle of the compass, and then, while the wire is in this posi-

tion, let its two ends be connected with the two poles of a galvanic battery. The needle will instantly turn away from its north and south position, and will remain deflected as long as the current continues to pass over it. If the current flows from south to north, the north end of the needle is turned to the west; and if the current is in the opposite direction, the needle turns the other way. This is the easiest test for determining the direction in which a current is flowing through a wire; and it is the basis of the construction of *galvanometers*, which are the instruments chiefly employed for the measurement of currents. The current tends to make the needle take a position at right angles to the direction of the current; but as the earth tends to make the needle point north and south, the position actually taken is between the two. The fact that a current deflects a needle was discovered by Œrsted of Copenhagen, and the general rule for the direction of the deflection was thrown into the following form by Ampère; *Imagine the current to enter at your feet and come out at your head, then the north pole of a needle in front of you will be deflected to your left.* This rule holds good whether the current is above the needle, below it, or in any other position. The rule may also be put in the following form: Imagine an ordinary screw placed so that the current is in its axis; the north pole of the needle will turn to the same side to which that part of the circumference which is next it turns when the screw advances in the direction of the current.

The leading fact of *magneto-electricity* is that when a magnet is moved in the neighborhood of a wire or other conductor, the motion causes a current of electricity in the conductor; and a similar effect occurs if the wire is moved while the magnet remains at rest. In the experiment, above described, of making a magnetic needle turn on its pivot by sending a current through a wire held above it, the motion of the needle produces for the time being a weakening of the current. If the needle were made by mechanical means to turn the contrary way, it would strengthen the current for the time being. If there were no original current, the turning of the needle to either side by mechanical means would produce a current in the wire. The current thus produced is always opposite in direction to that which would aid the motion.

Electro-medical Machines, machines intended for producing stimulation for medical purposes. They are of various kinds, but they all produce their effects by a rapid succession of either interruptions or reversals of an electric current. Such interruptions or reversals are always accompanied by the action called *self-induction*, especially when the original current flows through a coil of many convolutions, and still more if these convolutions encircle an iron core. Self-induction in such cases shows itself as a sudden and violent action, having the same sort of relation to a steady current that a blow has to a steady pressure. One form of electro-medical machine is shown above. At the top of the figure are shown two small galvanic cells, in which for greater portability materials of pasty consistency are used instead of liquids. The bottle shown below is for replenishing them. In the center of the figure are seen two cylindrical coils, through which the current from the two cells passes. They have cores of soft iron to strengthen their action, and they have also sliding covers of copper for mitigating their action. These are shown in the figure as pulled out a short distance so as to uncover a small portion of the coils. The shocks become stronger as these covers are drawn farther out. The action of the covers may be described as a muffling or cushioning of the sudden violence of self-induction. Some of the commonest forms of electro-medical machine are magneto-electric, their currents being produced by making a coil of copper wire rotate rapidly between the poles of a strong magnet. The employment of such a machine for administering shocks to patients is called *faradization*, from Faraday, the discoverer of magneto-electricity.



Electro-medical Machine.

Electro-metallurgy, the art of depositing metals from solutions of their salts upon metallic or other conducting surfaces by the agency of an electric current. Its operations may be classified under three heads: the making of facsimiles, the formation of permanent coatings, and the

obtaining of a pure metal from an impure. In every instance the current enters the solution by a plate of the metal in question, which is immersed in it, and leaves the solution by the conducting surface on which the deposit is formed. The plate at which the current enters (called the *anode*) is gradually dissolved, and an equal quantity of the metal is at the same time deposited on the surface by which the current leaves the solution (called the *cathode*). The source employed for giving the current was formerly a galvanic battery, but is now more frequently a dynamo machine, in which the armature is constructed of much stouter wire than is used in dynamos intended for other purposes. Copper lends itself with special readiness to electrical deposition, and the solution employed for the purpose is usually a saturated solution of sulphate of copper; but if the surface to be coated is of iron, steel or zinc, it is necessary to employ an alkaline solution, in which cyanide of potassium and carbonate of soda are usually the chief ingredients, a salt of copper being present in a comparatively small quantity. For electro-gilding, a solution containing cyanide of potassium and cyanide of gold is employed; and for electro-plating, a solution of cyanide of potassium and cyanide of silver. It so happens that the impurities which usually occur in copper roughly smelted from the ore consist of substances which either cannot be dissolved in a solution of sulphate of copper or cannot be deposited on a copper surface from such a solution. Hence when a plate of crude copper is used as the anode, pure copper is deposited on the cathode, and most of the impurities fall to the bottom of the vessel. Pure copper is now produced in enormous quantities by this method, purity being an essential requisite in copper wire for electrical purposes.

The most important instance of the deposition of a permanent coating is electro-plating. To insure good adhesion it is necessary to remove every particle of grease and oxide from the surface (usually German silver) on which the silver is to be deposited. With this view the article to be plated, after being well scoured, is boiled in a strong lye of caustic potash or soda, and dipped in dilute acid, technically called *pickle;* after which it is washed in distilled water, and then quickly dipped in a solution of nitrate of mercury until it appears white on the surface. Finally it is suspended in the silver solution, when it is immediately coated with a thin film of silver. This operation is called *striking.* After a few seconds it is taken out and well brushed, generally with bundles of brass wire attached to a lathe; it is then washed and replaced in the plating solution, where it is allowed to remain for a longer or shorter period according to the thickness of deposit required. An immersion of a few hours is generally sufficient. To ascertain the amount of metal deposited it is only necessary to weigh the articles from time to time. One and a quarter or one and a half ounces of silver to the square foot gives an excellent plate about the thickness of common writing-paper. In ordinary circumstances the coating of deposited silver is chalk-white, and has a dead or matted appearance, which is much esteemed for medals. Sometimes the operator is desirous of having his object bright, either entirely or partially. In this case the object is brushed over with old beer or dipped into a solution of soft soap, and is then submitted to the burnisher. Certain chemicals added to the solution will cause the original deposit to have a metallic luster.

The production of copper facsimiles by the electric current is called *electrotype,* and is the oldest branch of electro-metallurgy. One of its most important applications is the copying of type set up for printing, and of wood blocks for wood-cuts. A mold is first obtained in gutta percha or some similar material. This, being a non-conductor, is brushed over with plumbago in its interior, so as to give it a conducting surface to receive the deposit. After several hours the deposit is detached from the *mold* and backed by pouring in melted solder, the surface being first moistened with chloride of zinc to make the solder adhere. In the copying of steel engravings the mold is obtained by electro-deposition of copper on the steel, the surface of which must first be specially prepared to prevent adhesion; and a second electro-deposition of copper, on the mold thus obtained, gives the required copy, from which impressions can be printed.

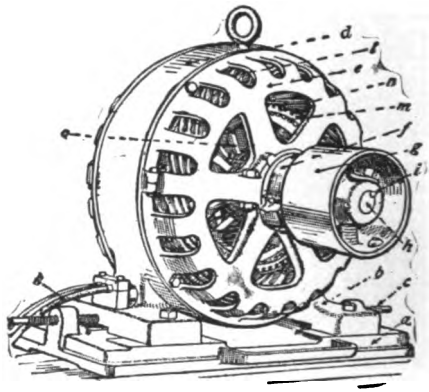
Electrometer (e-lek-trom'e-tĕr), an instrument intended for accurate electro-statical measurements. Stated in precise technical language, its purpose is to measure the *difference of potential* between two conductors. Most of the electrometers in actual use are inventions of Sir William Thomson, who was the first to give accuracy to this branch of electrical measurement. His quadrant electrometer is the instrument chiefly used, and its indications are usually given by means of a small movable mirror which reflects a

spot of light from a lamp on to a paper scale. When the two conductors which are tested have the same *potential* the spot of light stands in the middle of the scale, and its movement to either side indicates the difference of their potentials. The instrument is sufficiently delicate to give a sensible displacement when the two conductors are the two plates of single galvanic cell; and a displacement twice as great will be obtained by combining two such cells.

Electromotive Force, a phrase (commonly abbreviated into the three initial letters e.m.f.) which is of very frequent use in modern electrical literature, especially in connection with electric currents. The e.m.f. in a wire through which a current is flowing may be compared to the difference of pressures in a long, narrow, horizontal pipe, through which water is flowing. As the difference of the pressure at the two ends of the pipe forces the water through in spite of frictional resistance, so the difference of the *potentials* at the two ends of the wire forces the current through in spite of the electrical resistance of the wire. This *difference of potentials* is another name for *electromotive force.* Each cell of a battery is a source of e.m.f., and when the cells are connected in the usual way (technically called *in series*) their e.m.f.'s are added together, so that, for example, the e.m.f. of a battery of ten cells is ten times the e.m.f. of one cell. E.m.f. can also be produced in a wire by moving a magnet in its neighborhood, and this e.m.f. will be exactly proportional (other things being equal) to the velocity of the motion. The commercial unit of e.m.f. is the *volt.* Its magnitude may be inferred from the statement that the e.m.f. of a single cell is usually more than one volt, and less than 2½ volts.

Electro-motors, are, fundamentally, electric generators reversed in function, they transform into mechanical energy the continued stresses between two electromagnetic fields relatively movable. Just as generators convert into electromagnetic stresses the mechanical energy applied to them. The torque of the motor is the dynamical result of the electromagnetic stresses between the magnetic field of the motor and that due to the armature currents. There are various types of motors. The first broad distinction is between direct current and alternating current motors, made chiefly for the purpose of classification since both depend upon the same broad principles.

Direct Current Motors. The feature distinguishing direct from alternating current motor is the use of a *commutator* which consists of a number of copper bars, corresponding to the number of coils in the armature, insulated from each other by mica, and turned to the shape of a

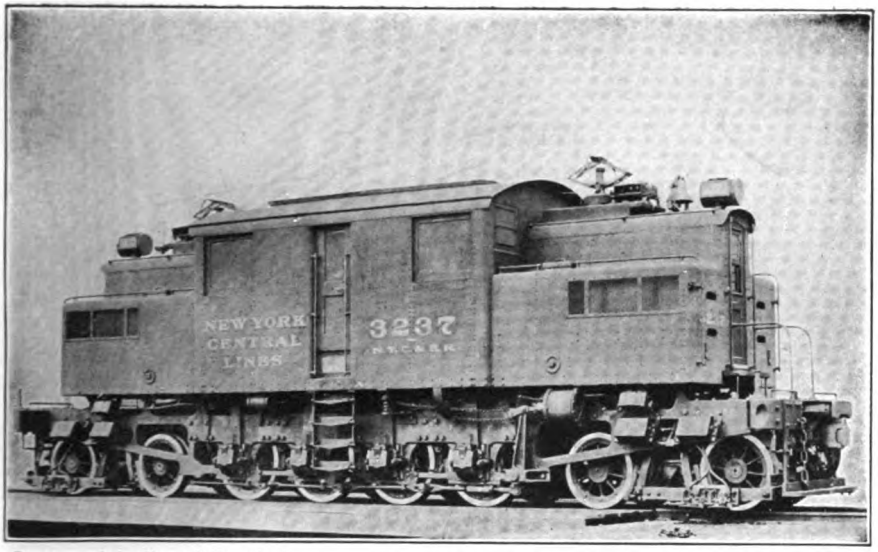


INDUCTION MOTOR.

a, bed-plate; *b*, foot; *c*, belt-tightening bolt; *d*, frame; *e*, end-plate; *f*, bearing; *g*, pulley; *h*, shaft; *i*, key; *k*, leads; *l*, primary or stator winding; *m*, secondary or rotor bars; *n*, rotor end-ring; *o*, rotor ventilator.

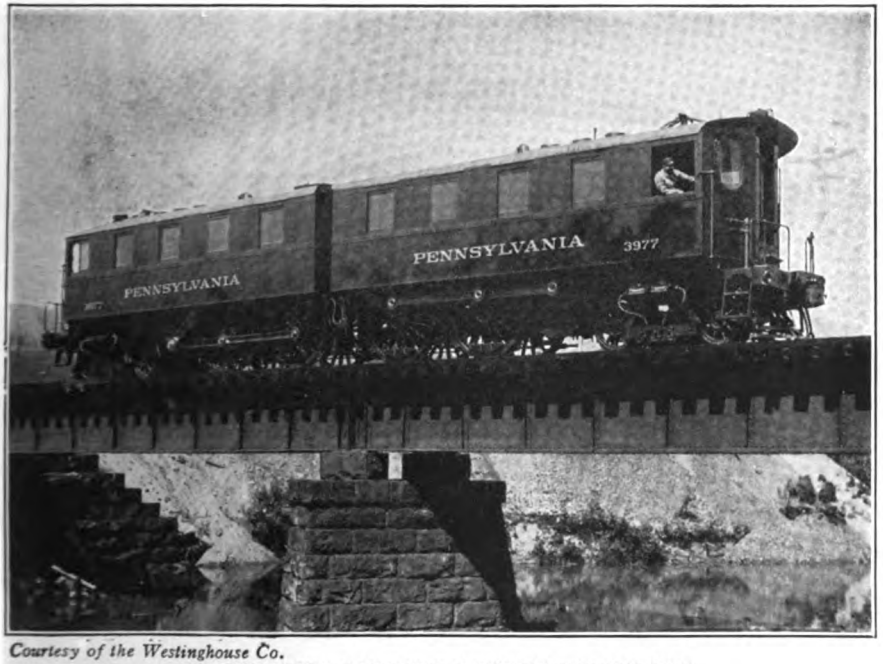
sleeve which is carried upon the armature shaft or on an extension of the armature spider. The ends of the corresponding coils are soldered into slots at the ends of the commutator bars. From the commutator the current is collected by brushes, two sets of which are used for every pair of poles, but in multipolars if commutator segments to be at the same potential are connected together a single pair of brushes may be used.

Alternating Current Motors. There are two principle types of alternating current motors, *induction* and *synchronous.* The induction motor was developed from the fact that a copper disc can be made to revolve by rotating a horse-shoe magnet so that the lines of force cut the disc. It is somewhat similar to the direct current shunt wound motor. Both motors have field and armature windings. In both cases all the field is connected directly across the mains. In the shunt wound motor the armature current is supplied through brushes and a commutator to the winding, while in the induction motor the armature current is an indirect current, the field acting as the primary of which the armature is the secondary. In practice either the field



Courtesy of the General Electric Co.

NEW YORK CENTRAL ELECTRIC LOCOMOTIVE



Courtesy of the Westinghouse Co.

PENNSYLVANIA RAILROAD ELECTRIC LOCOMOTIVE

Two of the best known types of electric locomotive. The New York Central type is 43 feet long, 14 feet 9½ inches high, and weighs 230,000 pounds. It is equipped with four 550 horsepower motors and has a maximum speed of 60 miles per hour. The Pennsylvania type is the latest development. It is built in two halves for flexibility and either half may be replaced during repairs. The complete unit weighs 157 tons, is 64 feet 11 inches long, and the motors have combined horsepower of 4000, giving a draw bar pull of 79,200 pounds, and a speed of 60 miles per hour.

or the armature may be the one to revolve. The rotation is produced by the reaction of the armature, or indirect current, on the revolving magnetic field, which results in dragging the moving part around in order to keep up with the field flux as it passes around the face of the primary windings. This field being the resultant of two or more alternating fields of different phases, rotates with the polar frequency of supplied voltage. The secondary winding is made up of copper bars set in slots in a laminated iron core and running across the armature parallel with the axis of rotation. Sometimes the secondary windings are joined to heavy, short circuiting rings at both ends resulting in the squirrel cage type of motor, and in other cases the secondary windings are taken out through collector rings if the secondary be the rotating element. The *synchronous* motor consists merely of an alternating current generator of special design. Both motors and generators have a direct current field and an alternating current armature. The operation of a synchronous motor is the same as that of an alternating current generator in parallel with one or more other alternators. When the back pressure of the motor is equal and directly opposed to that of the line no current can flow. The friction, however, causes the revolving element to lag slightly between the line pressure and a current is driven through the motor by the generator. The great advantage of a synchronous over an induction motor is that the power factor can be raised or lowered at will. By raising the field strength of a synchronous motor the current taken by the motor may be made leading and hence help to keep up the line voltage on a heavy inductive load. Another advantage of the synchronous motor is that it can easily be built for very high voltage. Motors of this type have been built to run on a current of upwards of 12,000 volts, thus dispensing with the use of a transformer. See *Electric Railway*, *Electricity*.

Electron (e-lek'tron), the hypothetical basis of the atom, of such minuteness that it is believed that about 1800 electrons make up the atom of hydrogen, with a larger number in others in proportion to their weight. It is given off by radium, and appears to be the carrier of negative electricity. This doctrine of the electron is the existing hypothesis of the composition of the atom, replacing the vortex theory of Lord Kelvin, and was developed as a result of investigation of the cathode electric ray, as observed in a Crookes vacuum tube. This ray is apparently made up of exceedingly minute corpuscles, which there is considerable reason to believe form the basis of the atom. Thus, the electron theory is founded on investigation, not on pure conjecture, like the former atom theories.

Electrophorus (e-lek-trof'o-rus), an electrical instrument consisting of two plates, the lower of vulcanite or shellac, with tinfoil or other metal at the bottom, and the upper of brass, with a glass handle. The operator begins by applying friction with a catskin or flannel to the upper surface of the lower plate, which thus acquires a negative charge. The upper plate is then placed upon it and pressed closely down. In this process the upper plate, being in connection with the earth through the body of the operator, acquires a positive charge by induction; and if the upper plate be now lifted off by its glass handle, a good spark can be obtained from it. It may then be pressed down again, removed again, and another spark obtained, and so on, time after time.

Electrophorus.

Electroplate (e-lek'trō-plāt). See *Electro-metallurgy*.

Electroscope (e-lek'trō-skōp), any apparatus for showing the presence of electricity without giving quantitative measurements. A sensitive instrument is the goldleaf electroscope, which is represented in the adjoining figure. Here the two gold leaves are shown diverging under the influence of an electrified body held over the instrument. The gold leaves are attached to the lower end of a short rod of brass, whose upper end carries the brass knob which forms the top of the instrument. These metal parts are supported by the glass shade which insulates them from the earth, and the upper part of which is represented in the figure as coated with varnish, but this is not essential. The two gold leaves originally hang down parallel, and nearly touching each other. When an electrified body is slowly brought down over the knob from a good height above it, the unlike electricity is attracted to the knob,

Gold-leaf Electroscope.

and the like electricity is repelled into the gold leaves, which, in consequence of being thus electrified, repel each other. The two little brass columns standing up from the base are in connection with the earth, and their presence increases the divergence of the leaves.

Electrotype (e-lek'trō-tīp), that branch of electro-metallurgy which deals with the production of facsimiles. See *Electro-metallurgy*.

Electrum (e-lek'trum; Gr. *ēlektron*), in antiquity, a term applied originally to native gold, which frequently contains notable quantities of silver, copper and other metals; hence latterly it was transferred from this native alloy to the artificial alloy of gold and silver, and was also applied to amber on account of its color and inferior luster.

Electuary (e-lek'tū-a-ri), the name given to medical preparations of a pasty consistency, made by thoroughly mixing some kind of fine powder with syrup, honey or sugar, for internal use.

Elegit (e-lē'jit), in English law, a writ by which a creditor who has obtained a judgment against a debtor, and is hence called the *judgment-creditor*, may be put in possession of the lands and tenements of the person against whom the judgment is obtained, called the *judgment-debtor*, until the debt is fully paid. The writ is addressed to the sheriff. It is still in use in the United States.

Elegy (el'e-gi; Gr. *elegos*), a mournful and plaintive poem or funeral song, or any serious poem of a melancholy contemplative kind. In classic poetry what is known as *elegiac verse* is composed of couplets consisting of alternative hexameter and pentameter lines.

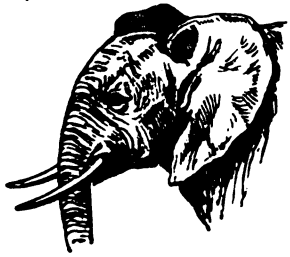
Elemental Spirits (e-le-men'tal), according to a belief common in the middle ages, spirits proper to and partaking of the four so-called elements, viz., salamanders or fire spirits, sylphs or aerial spirits, gnomes or earth spirits, and undines or water spirits.

Elements (el'e-ments), the simplest constituent principles or parts of anything; in a special sense, the ultimate indecomposable constituents of any kind of matter. In ancient philosophies the term was applied to fire, air, earth and water. The mediæval chemists, however, absorbed in the study of metals and mineral substances, supposed that the metals consisted of an elemental sulphur and an elemental mercury mixed together more or less perfectly and in different proportions. To these were subsequently added salt and some others, so that about the middle of the seventeenth century the first principles amounted to five, divided into two classes: the active, consisting of mercury or spirit, sulphur or oil, and salt; and the passive, consisting of water or phlegm, and earth or the terrestrial part. The names remained, not so much as denoting substances or ultimate principles, as gradually coming to denote functions, the first great modification being the expansion of the idea of elemental sulphur into phlogiston by Stahl, as the result of which the adherents of the phlogistic theory applied the term to phlogiston, to the gases then discovered, the mineral, vegetable and animal acids, the alkalies, earths and metallic calces, oil, alcohol and water. The substances considered as simple naturally changed with the change of theory introduced by Lavoisier, who considered as elements oxygen, nitrogen, hydrogen, sulphur, phosphorus and carbon, the metals and the earths, and, as Boyle had already suggested, practically defined an element as a body not yet decomposed, the definition now commonly adopted. For list of known elements see *Chemistry*.

Elemi (el'e-mi), the resinous exudation from various trees, such as the *Canarium commune*, from which the Eastern or Manila elemi is obtained; the *Icica Icicariba*, the source of the American or Brazilian elemi; and the *Elaphrium elemiferum*, from which the Mexican elemi comes. It is a regular constituent of spirit varnishes, and is used in medicine, mixed with simple ointment, as a plaster.

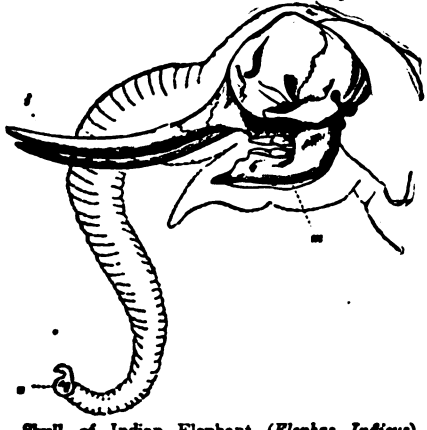
Elephant (el'e-fant), the popular name of a genus or subfamily of five-toed proboscidian mammals, usually regarded as comprehending two species, the Asiatic (*Elephas Indicus*) and the African (*E. Africanus*). From a difference in the teeth, however, the African species is sometimes treated as a distinct genus (*Loxodon*), and some authors divide the Asiatic elephants into several species, such as the Indian elephant (*Elephas Indicus*), the Ceylon elephant (*E. Cingalensis*), and the Sumatra elephant (*E. Sumatranus*). The so-called white elephants are merely albinos. The African elephant is distinguished from the Asiatic species by its greater height, its larger ears, its less elevated head and bulging or convex forehead, the closer

approximation of the roots of the tusks, and the greater density of the bone. It has also only three external hoofs on the hind-feet, while the Asiatic has four. All



Head of African Elephant (*Elephas Africanus*).

elephants are remarkable for their large, heavy, short bodies supported on columnar limbs, a very short neck, a skull with lofty crown and short face-bones, with the exception of the premaxillaries, which are enlarged to form tusk sockets. To compensate for the short neck, they have the long proboscis, often 4 or 5 feet in length, produced by the union and development of the nose and upper lip. It is made up of muscular and membranous tissue, the only cartilages being the valves at the entrance of the nares. The trunk is of great strength and sensibility, and serves alike for respiration,



Skull of Indian Elephant (*Elephas Indicus*), *i*, incisor tusks; *m*, molars; *n*, nostrils.

smell, taste, suction, touch and prehension. The tusks, which are enormously developed upper incisor teeth, are not visible in young animals, but in a state of maturity they project, in some instances 7 or 8 feet. The largest on record (possibly that of an extinct species) weighed 350 lbs. Elephants sometimes attain the height of 15 feet, but their general height is about 9 or 10. Their weight ranges from 4000 to 9000 lbs. The female is gravid twenty months, and seldom produces more than one at a birth; this, when first born, is about 3 feet high, and continues to grow till it is sixteen or eighteen years of age. It is said they live to the age of 100 years and upwards. They feed on vegetables, the young shoots of trees, grain and fruit. They are polygamous, associating in herds of a considerable size under the guidance of a single leader. An elephant leaving or driven from a herd is not allowed to join another, but leads a solitary, morose and destructive life. These are popularly known as 'rogues.' Elephants are caught either singly or in herds. In the former case it is necessary to catch adroitly one of the elephant's legs in the noose of a strong rope, which is then quickly attached to a tree; another leg is then caught until all are securely fastened. His captors then encamp beside him, until under their treatment he becomes tractable. When a number are to be caught a strong enclosure is constructed, and into this the elephants are gradually driven by fires, noise, etc. With the aid of tame elephants the wild ones are tied to trees and subjected to the taming process. The domesticated elephant requires much care, and a plentiful supply of food, being liable to many ailments. The daily consumption of a working elephant is, according to Sir J. E. Tennent, 2 cwts. of green food, about half a bushel of grain and about 40 gallons of water. Their enormous strength, docility and sagacity make them of great value in the East for road-making, building and transport. They are used by the great on occasions of pomp and show, being often richly caparisoned, and bearing on their back a howdah containing one or more riders, besides the mahout or driver sitting on the animal's neck. Tiger shooting is often practiced from an elephant's back. The fossil remains of the genus *Elephas* indicate the former existence of at least fourteen species; and a still larger number of species belonging to the allied genus *Mastodon*.

Elephant, Order of the, an ancient Danish order of chivalry, said to have been instituted about the end of the twelfth century by Canute VI to perpetuate the memory of a Danish Crusader who had killed an elephant in the Holy Land. It was renewed by Christian I in 1462, in 1693 by Chris-

tian V, and again in 1808. It is the highest of the Danish orders. The number of members, not counting those of the royal family, is restricted to thirty. The badge of the order is an enameled white elephant, bearing on a blue housing, bordered with gold and crossed with white. a sculptured tower. The device is *Magni animi pretium.*

Elephanta (el-e-fan'ta), a small island in the Bay of Bombay, between Bombay and the mainland, 7 miles northeast of the former; circumference about 5 miles. It consists of two long hills chiefly overgrown with wood. It has a few inhabitants, who rear sheep and poultry for the Bombay market. It is celebrated for its rock temples or caves, the chief of which is a cave-temple supposed by Mr. Ferguson to belong to the tenth century, 130 feet long, 123 broad and 18 high, supported by pillars cut out in the rock, and containing a colossal figure of the trimurti or Hindu trinity Brahma, Vishnu and Siva. This temple is still used at certain Hindu festivals.

Elephant-apple, an East Indian tree (*Feronia Elephantum*) producing an edible fruit not unlike an orange, and belonging to the same natural order, Aurantiaceæ.

Elephant Bay, an excellent anchorage on the coast of Benguela, S. W. Africa.

Elephant-beetle, the Goliath beetle.

Elephant-fish (*Callorhynchus Antarcticus*), a fish of the order Elasmobranchii (rays and sharks), so named from a proboscis-like structure on the nose; called also southern chimera. It inhabits the Antarctic seas, and is palatable eating.

Elephant-grass (*Typha elephantina*), a large kind of bulrush growing in India.

Elephantiasis (el-e-fan-tī'a-sis), a disease chiefly occurring in tropical climates, characterized by a peculiar overgrowth of the skin and subjacent textures, and attacking especially the legs, which become enlarged and elephantine. It appears to arise from repeated inflammation of the skin and a concurrent obstruction of the veins and lymphatic glands of the inflamed part. The disease occasionally affects the scrotum, enlarging it to enormous dimensions. In general it is attended with little pain, and the health may remain otherwise unaffected for many years. In the early stages wet bandaging or ligature of the main artery has been found serviceable, but amputation may be necessary.

Elephantine (el-ē-fān'tē-nā), a small island of Egypt, in the Nile, opposite Assouan (Syene). It is covered with ruins piled upon each other —Egyptian, Roman, Saracen and Arabic, the most important being a gateway of the time of Alexander, a small temple dedicated to Khnum and founded by Amenophis III, and the ancient Nilometer mentioned by Strabo. The island gave the fifth dynasty to Egypt.

Elephant River, a river of Cape Colony, running into the Atlantic after a course of 140 miles.

Elephant-seal, the Proboscis Seal, or Sea-elephant, the largest of the seal family (Phocidæ). There are probably two species, one (*Macrorhinus angustirostris*) found only on the coast of California and Western Mexico, the other (*Macrorhinus leoninus*) found in Patagonia, Kerguelen Island, Heard's Island and other parts of the Southern Seas. They vary in length from 12 to 30 feet, and in girth at the chest from 8 to 18 feet. The proboscis of the male is about 15 inches long when the creature is at rest, but elongates under excitement. The females have no proboscis, and are considerably smaller than the male. Both species are becoming rare from continued slaughter.

Elephant's-ear, a name sometimes given to plants of the genus *Begonia.*

Elephant's-foot, the popular name of *Testudinaria elephantipes*, a plant of the nat. order Dioscoreaceæ (yams, etc.), distinguished by the shape of its root-stock, which forms a nearly hemispherical mass rising a little above the ground, covered with a thick, corky bark. It has a slender, climbing stem growing to a length of 30 or 40 feet, with small, heart-shaped leaves and greenish-yellow flowers. It is known in the Cape Colony as Hottentots' bread. Some botanists still class it with the very similar species of the genus *Tamus.*

Elephant's-tusk Shell, a name given to shells of the genus *Dentalium* (which see).

Eleusine (el-ū-sī'nē), a genus of grasses, several of which are cultivated as grain plants in India, Japan, Tibet, etc.

Eleusinian Mysteries (el-ū-sin'-i-an), the sacred rites anciently observed in Greece at the annual festival of Dēmētēr or Ceres, so named from their original seat,

Eleusis. As a preparation for the greater mysteries celebrated at Athens and Eleusis, lesser Eleusinia were celebrated at Agræ on the Ilissus. The greater Eleusinia were celebrated in the month Boedromion (September—October), beginning on the 15th of the month and lasting nine days. The celebrations, which were varied each day, consisted in processions between Athens and Eleusis, torch-bearing and mystic ceremonies attended with oaths of secrecy. They appear to have symbolized the old conceptions of death and reproduction, and to have been allied to the orgiastic worship of Dionysus (Bacchus). They are supposed to have continued down to the time of Theodosius I.

Eleusis (e-lū'sis), in ancient geography, a small city of Attica, about 14 miles from Athens, near the shore opposite the island of Salamis. Its temple of Dēmē'tēr was one of the most beautiful buildings of Greece. (See *Eleusinian Mysteries.*) There is now a large straggling village here.

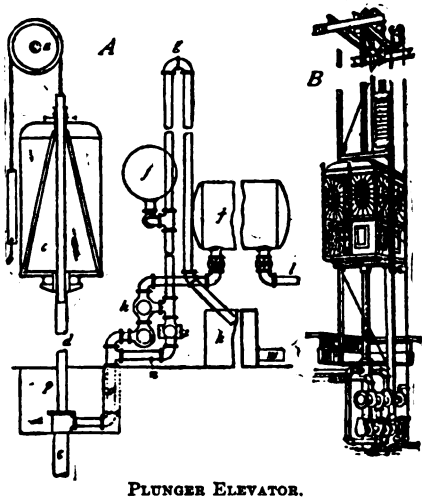
Eleuthera (e-lū'th e r-a), one of the largest of the Bahama Islands. It is of very irregular shape, its length being about 70 miles, and its breadth in general from 2 to 4 miles, though in one part 10. Pop. about 7500.

Eleutheria Bark (e-lū-thē'ri-a), a name for cascarilla bark.

Elevation (el-e-vā'shun), in architecture, a geometrical delineation of the front or any face of a building in which all the parts are drawn according to scale, and not shown as they would appear in perspective.—In astronomy, it is the height of a celestial object above the horizon.

Elevation of the Host, in the ritual of the mass, is the lifting up of the elements immediately after consecration, to be worshiped by the people. It was introduced into the Latin church in the eleventh century, in consequence of the denial by Berengarius of the real presence in the sacrament. The Council of Trent ordered that the host should be worshiped with the highest adoration, that of *latria*, which is offered to God only.

Elevator (el'e-vā-tur), (1) a mechanical contrivance consisting of a series of boxes or buckets attached to a belt traveling round two drums, one above and one below, for hoisting grain, meal, etc. In the United States large buildings containing such contrivances, and in which grain is stored, receive the same name. (2) An apparatus for raising or lowering persons or goods to or from different levels in warehouses, hotels,



PLUNGER ELEVATOR.

A, diagram of parts; B, general view; *a*, overhead pulley; *b*, counterweight; *c*, cage; *d*, plunger; *e*, hydraulic cylinder; *f*, equalizing or auxiliary discharge tank; *g*, exhaust or discharge-pipe; *h*, *i*, controlling valves; *j*, receiving water-tank from pump; *k*, receiving tank for discharge or exhaust water; *l*, delivery pipe from pressure-pump; *m*, suction-pipe to pump; *n*, by-pass pipe from pressure to exhaust sides; *o*, thoroughfare pipe between valves and pressure cylinder; *p*, pit below floor-level, to act also as air-cushion.

etc., consisting usually of a cage or movable platform worked by hydraulic power; also called a *lift* or *hoist.*

Elf. See *Fairy.*

Elf-arrows, ELF-BOLTS, ELF-S H O T, popular names in Britain for stone arrowheads, and other similar ancient barbarian weapons. They are superstitiously worn as charms against lightning; cattle and men are said to have been struck and wounded by them; and they are said to appear in great quantities where the day before there were none.

Elgin (el'gin), a royal and parliamentary burgh of Scotland, capital of Elgin county, finely situated on the Lossie, about 5 miles from its influx into the Moray Firth, 70 miles N. W. of Aberdeen. The town largely consists of mansions and villas. The most interesting edifice is the cathedral, founded in 1224, now in ruins, but once the most magnificent in Scotland. Pop. 8460.—The COUNTY OF ELGIN, also called Morayshire, is a maritime county, bounded by the Moray

Firth, Banffshire, Inverness-shire and Nairnshire; area, 476 sq. miles. Along the sea-coast, which extends for more than 30 miles, the surface is flat, but inland it rises into hills of moderate elevation, intersected by fine and fertile valleys. Inexhaustible quarries of freestone (rich in fossils) are worked. The climate is noted for its general mildness, dryness and salubrity. The lower tracts of land are fertile and highly cultivated, the principal crops being wheat, oats, potatoes and turnips. The great majority of farms are small. A portion of the surface is still covered with native forests. Pop. 44,868.

Elgin, a city of Kane and Cook counties, Illinois, on Fox River, 38 miles N. W. of Chicago. It has a famous watch factory and various flourishing industries, and is the center of the great dairy industry of the Middle West. Pop. 25,976.

Elgin, JAMES BRUCE, EIGHTH EARL OF, and twelfth Earl of Kincardine, governor-general of India, born in 1811; educated at Eton and Christ Church; he entered parliament in 1841 as member for Southampton, and in the same year succeeded to the earldom. He was appointed governor-general of Jamaica in 1842, and in 1846 governor-general of Canada. In 1849 he was raised to the British peerage as Baron Elgin of Elgin. In 1857 he went as special ambassador to China, and was successful in concluding the Treaty of Tientsin early in 1858. In 1859 he became postmaster-general in Palmerston's cabinet, but in the following year was sent on a special mission to Pekin, and afterwards appointed to succeed Canning as governor-general of India. He died in 1863 while inspecting the Himalayan passes.

Elgin Marbles, the splendid collection of antique sculptures brought chiefly from the Parthenon of Athens to England by the seventh Earl of Elgin (1766-1841) in 1814, and afterwards purchased by parliament for the British Museum at a cost of £35,000 (less than half the sum expended on them). They consist of figures in low and high relief and in the round, representing gods, goddesses and heroes; the combats of the Centaurs and Lapithæ; the Panathenaic procession, etc. They exhibit Greek sculpture at its highest stage, and were partly the work of Phidias.

El Hasa (el hä'sä), a fertile district of Eastern Arabia, on the Persian Gulf. It produces dates, wheat, millet, rice, etc. Pop. estimated at 160,000.

Eli (ē'lī), one of the Hebrew judges, the predecessor of Samuel. He was high priest and judge for forty years, but was less successful as head of his own household. His two sons having been slain and the ark taken in battle by the Philistines, the news proved so severe a shock that he fell and broke his neck, at the age of ninety-eight.

Elias (e-lī'as). See ELIJAH.

Elias, MOUNT ST., one of the highest peaks of North America, near the line of demarkation between the British territory and Alaska, but a little within the latter; height, 19,500 feet.

Elijah (e-lī'ja), the most distinguished of the prophets of Israel, who flourished in the ninth century B.C., during the reigns of Ahab and Ahaziah, and until the beginning of the reign of Jehoram, and denounced vengeance on the kings of Israel for their apostasy. He incurred the anger of Jezebel, wife of Ahab, for slaying the prophets of Baal, but escaped to Horeb, afterwards returning to Samaria to denounce Ahab for the murder of Naboth. The Biblical narrative tells us that Elijah finally ascends to heaven in a chariot of fire, Elisha, his successor, being witness. See I Kings, xvii to xxi, and II Kings, i and ii.

Eliot (el'i-ot), CHARLES WILLIAM, educator, born at Boston, Massachusetts, in 1834. Graduating at Harvard College in 1853, he was an assistant there in mathematics and chemistry, 1858-63. He became professor of chemistry at the Massachusetts Institute of Technology in 1865 and in 1869 became president of Harvard University. This post he held for forty years, resigning in 1909 and becoming president emeritus. He is the author of various chemical and other works.

Eliot, GEORGE, the assumed literary name of Mary Ann, or, as she preferred to write the name in later years, Marian Evans, a prominent English novelist. She was the daughter of a Warwickshire land agent and surveyor, and was born at Griff, near Nuneaton, on November 22, 1819. She received at Coventry an excellent education, comprising the classical and modern languages, and shortly after her twenty-first year became a convert to Rationalism. Her first literary undertaking was the completion of Mrs. Hennell's translation of Strauss' *Life of Jesus* (1846). After spending two years abroad she boarded at the house of John Chapman, editor of the *Westminster Review*, of which she became subeditor. It was

not, however, until January, 1857, that she came prominently into public notice, when the first of a series of tales entitled *Scenes from Clerical Life* appeared in *Blackwood's Magazine*. The series came to an end in November, 1857, and in the following year the publication of *Adam Bede* placed her in the first rank of writers of fiction. It was succeeded by the *Mill on the Floss* (1860), *Silas Marner* (1861), *Romola* (1863), *Felix Holt* (1866), *Middlemarch* (1872), and *Daniel Deronda* (1876). In addition to those prose works she published three volumes of poems, *The Spanish Gypsy* (1868), *Agatha* (1869), and the *Legend of Jubal* (1874). Her last work published during her life was the series of essays entitled *The Impressions of Theophrastus Such* (1879), but a volume of mixed essays was issued posthumously. For many years she was happily associated both in life and work with George Henry Lewes, though a legal union was impossible during the lifetime of Mrs. Lewes. In May, 1880, after Mr. Lewes' death, she married Mr. John Cross, but did not survive the marriage many months, dying rather suddenly at Chelsea on December 22d of that year.

Eliot, JOHN, missionary, born in England in 1604, emigrated to Boston in 1631, and became minister of the Roxbury church. He learned the language of the Indians and began to preach to them in their own tongue. He traveled widely among them as a missionary, suffered many hardships, and acquired great influence over the aborigines. He translated the Bible into the Indian language and became known as the 'Apostle of the Indians.' Died in 1690.

Eliot, SIR JOHN, one of the ablest of the popular leaders of Charles I's reign, of an old Cornwall family, born in 1570. He entered parliament in 1614 as member of St. Germans, winning immediate reputation as an orator. As vice-admiral of Devon he was energetic in suppressing piracy. In the three parliaments of 1623, 1625, 1626, he made his way to the front of the constitutional party, joined Hampden and the rest in refusing contributions to the forced loan, and took a prominent share in drawing up the Remonstrance and Petition of Right. He was imprisoned in the Tower in 1629, and died, still in confinement, in 1632. During his imprisonment he wrote a work on constitutional monarchy entitled the *Monarchy of Man*.

Elis (ē'lis), a maritime state of ancient Greece.

Elisha (e-lī'sha), a Hebrew prophet, the disciple and successor of Elijah. Many miracles of prediction and cure, and even of raising the dead, are ascribed to him, but his figure is less original and heroic than that of his master. His period of prophecy extended for fully sixty-five years, from the reign of Ahab to that of Joash (latter half of the ninth century B. C.).

Elixir (e-lik'sēr), a word of Arabic origin, applied by the alchemists to a number of solutions employed in attempting the transmutation of metals into gold, and also to a potion, the *elixir vitæ*, or elixir of life, supposed to confer immortality.

Elizabeth, PAULINE ELIZABETH OTTILIE LOUISE, QUEEN OF ROUMANIA; celebrated as a poet and author under the pen name of *Carmen Sylva*, was born at Neuwied, Germany, in 1843, and married Prince Charles, later King of Roumania, second son of Prince Anthony of Hohenzollern. Her publications include *Thoughts of a Queen*, *Edleen Vaughan*, *Shadows on Life's Dial*, and many fairy tales and poems. She died March 2, 1916.

Elizabeth (e-liz'a-beth), Queen of England, daughter of Henry VIII and of Anne Boleyn, was born at Greenwich, September 7, 1533, and almost immediately declared heiress to the crown. After her mother had been beheaded (1536) both she and her sister Mary were declared bastards, and she was finally placed after Prince Edward and the Lady Mary in the order of succession. On the accession of Edward VI, Elizabeth was committed to the care of the

Queen Elizabeth.

queen-dowager Catherine; and after the death of Catherine and the execution of her consort Thomas Seymour she was kept under close supervision at Hatfield, where she received a classical education under William Grindal and Roger Aschham. After the death of Edward, Elizabeth vigorously supported the title of Mary against the pretensions of Lady Jane Grey, but continued throughout the whole reign an object of suspicion and surveillance. In self-defense she made every demonstration of zealous adherence to the Roman Catholic faith, but her inclinations were well known. On November 17, 1558, Mary's reign came to a close, and Elizabeth was immediately recognized queen by parliament. The accuracy of her judgment showed itself in her choice of advisers. Parker, a moderate divine (Archbishop of Canterbury, 1559), aiding her in ecclesiastical policy; while William Cecil, Lord Burleigh, assisted her in foreign affairs. The first great object of her reign was the settlement of religion, to effect which a parliament was called on January 25, and dissolved on May 8, its object having been accomplished. The nation was prepared for a return to the reformed faith, and the parliament was at the bidding of the court. The ecclesiastical system devised in her father's reign was reëstablished, the royal supremacy asserted, and the revised prayer book enforced by the Act of Uniformity. While, however, the formal establishment of the reformed religion was easily completed, the security and defense of the settlement was the main object of the policy and the chief source of all the struggles and contentions of her reign. Freed from the tyranny of Mary's reign, the Puritans began to claim predominance for their own dogmas, while the supporters of the Established Church were unwilling to grant them even liberty of worship. The Puritans, therefore, like the Catholics, were made irreconcilable enemies of the existing order, and increasingly stringent measures were adopted against them. But the struggle against the Catholics was the most severe, chiefly because they were supported by foreign powers; so that while their religion was wholly prohibited, even exile was forbidden them, in order to prevent their intrigues abroad. Many Catholics, particularly priests, suffered death during this reign; but simple nonconformity, from whatever cause, was pursued with the severest penalties, and many more clergymen were driven out of the church by differences about the position of altars, the wearing of caps and such like matters, than were forced to resign by the change from Rome to Reformation. Elizabeth's first parliament approached her on a subject which, next to religion, was the chief trouble of her reign, the succession of the crown. They requested her to marry, but she declared her intention to live and die a virgin; and she consistently declined in the course of her life such suitors as the Duc d'Alençon, Prince Erik of Sweden, the Archduke Charles of Austria and Philip of Spain. While, however, she felt that she could best maintain her power by remaining unmarried, she knew how to temporize with suitors for political ends, and showed the greatest jealousy of all pretenders to the English succession. With the unfortunate Mary, Queen of Scots, were connected many of the political events of Elizabeth's reign. On her accession the country was at war with France. Peace was easily concluded (1559); but the assumption of Francis and Mary of the royal arms and titles of England led to an immediate interference on the part of Elizabeth in the affairs of Scotland. She entered into a league with the Lords of the Congregation, or leaders of the Reformed party; and throughout her reign this party was frequently serviceable in furthering her policy. She also gave early support to the Huguenot party in France, and to the Protestants in the Netherlands, so that throughout Europe she was looked on as the head of the Protestant party. This policy roused the implacable resentment of Philip, who strove in turn to excite the Catholics against her, both in her own dominions and in Scotland. The detention of Mary in England (1568-87), whither she fled to the protection of Elizabeth, led to a series of conspiracies, beginning with that under the earls of Northumberland and Westmoreland, and ending with the plot of Babington, which finally determined Elizabeth to make away with her captive. The execution of Queen Mary (1587), though it has stained her name to posterity, tended to confirm her power among her contemporaries. The state of France consequent on the accession of Henry IV, who was assisted by Elizabeth, obviated any danger from the indignation which the deed had caused in that country; and the awe in which King James stood of Elizabeth, and his dread of interfering with his own right of succession to England, made him powerless. But Philip was not to be so appeased, the execution of Mary lending edge to other grievances. The fleets of Elizabeth had galled

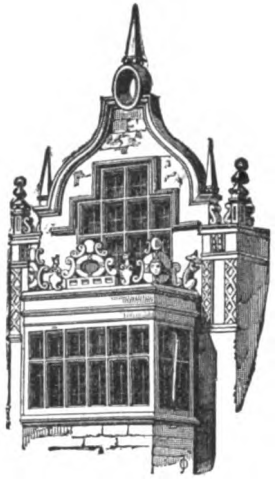
him in the West Indies, her arms and subsidies had helped to deprive him of the Netherlands; the Armada was already in preparation. Accordingly he called the Queen of England a murderess, and refused to be satisfied even with the sacrifice she seemed prepared to make of her Dutch allies. The Armada sailed on May 29, 1588. Its fate is too well known to need recapitulation. (See *Armada.*) The war with Spain dragged on till the close of Elizabeth's long reign. During her reign the splendor of her government at home and abroad was sustained by such men as Burleigh, Bacon, Walsingham and Throgmorton; but she had personal favorites of less merit who were often more brilliantly rewarded. Chief of these were Dudley, whom she created Earl of Leicester, and whom she was disposed to marry, and Essex, whose violent passions brought about his ruin. He was beheaded in 1601, but Elizabeth never forgave herself his death. Her own health soon after gave way, and she died on March 24, 1603, naming James VI of Scotland as her successor.

Elizabeth, a city of New Jersey, capital of Union Co., 4 miles s. w. of Newark and 12 miles from New York, with which it has ample communication by the Pennsylvania and Jersey Central railroads and by freight steamer. It is a favorite residence of New York business men. There are a large number of industries, including wire manufacturing, oil refining, coal tar products, bronze powders, leather, rubber, machinery, chemicals, roofing materials, electric motors, iron fences, etc. Pop. 80,000.

Elizabeth City, capital of Pasquotank county, North Carolina, 40 miles s. of Norfolk, with which it is connected by rail and by the dismal Swamp Canal. It has cotton, hosiery and other industries, and a large oyster trade. Here is the Atlantic Collegiate Institute and a State normal school for colored pupils. Pop. 8412.

Elizabeth, St., of Thuringia, daughter of Andreas II, king of Hungary, was born at Pressburg in 1207, and in 1221 was married to Ludwig, landgrave of Thuringia. She erected hospitals, fed a multitude of poor from her own table, and wandered about in a humble dress, relieving the wretched. Louis died on a crusade, and her own life terminated November 19, 1231, in a hospital which she had herself established. The church over her tomb at Marburg is one of the most splendid Gothic edifices in Germany.

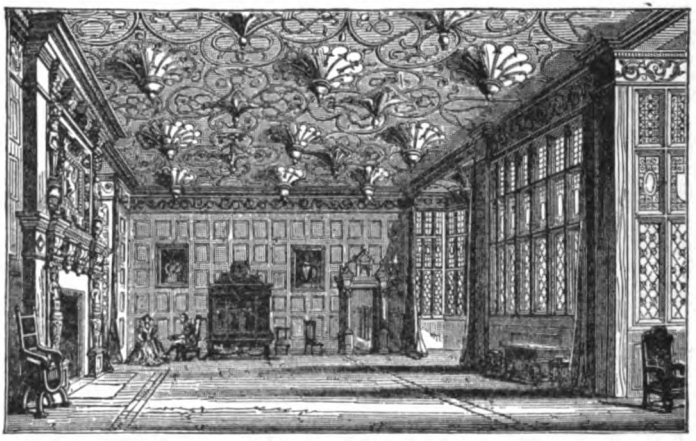
Elizabethan Architecture (e-liz'-a-beth-an), a style of architecture which prevailed in England during the reigns of Elizabeth and James I. It succeeded to the Tudor style, properly so called, with which it is sometimes confounded. The Elizabethan is a mixture of inferior



Elizabethan Window, Rushton Hall.

Gothic and debased Italian, producing a singular heterogeneousness in detail, with, however, wonderful picturesqueness in general effect, and domestic accommodation more in accordance with the wants of an advancing civilization than was afforded by the styles which preceded it. The chief characteristics of Elizabethan architecture are: windows of great size both in the plane of the wall and deeply embayed, ceilings very richly decorated in relief, galleries of great length, very tall and highly decorated chimneys, as well as a profuse use of ornamental strapwork in the parapets, window-heads, etc. The Elizabethan style is the last stage of the Tudor or Perpendicular, and from its corresponding in point of period with the Renaissance of the continent has sometimes been called the English Renaissance. The epithet Jacobean has sometimes been given to the very latest stage of the Elizabethan, differing from the Elizabethan proper in showing a greater admixture of debased Italian forms. The princely houses which arose during the reign of Elizabeth are numerous, and many even yet remain to attest the

splendor of the time. Of these may be mentioned Burghley House, Hardwick Hall and Bramhall Hall.



Drawing-room of Bramhall Hall, Cheshire. Time of Elizabeth.

Elizabeth Farnese (fär-nä'zā), Queen of Spain, daughter of Edward II, prince of Parma, born in 1692. On becoming the second wife of Philip V she surprised those who had counseled the marraige by assuming the practical headship of the kingdom; her ambition and that of her minister, Alberoni, disturbed the whole of Europe. The 'termagant, tenacious woman,' as Carlyle called her, died in 1766.

Elizabethgrad (ye-lyĕ-zä-vet-grät'), a town of Southern Russia, on the Ingul, with an imperial palace, a theater, manufactures of soap, candles, etc., and several great fairs. Pop. 61,800.

Elizabeth Islands, a group of sixteen American islands in Buzzards Bay, south of Cape Cod, frequented as a summer resort, and with a permanent pop. of about 200.

Elizabeth of Valois, or ISABELLA, Queen of Spain, was born in 1545, daughter of Henry II of France, and Catharine de Medici. She was destined by the Treaty of Cateau-Cambrésis to be the wife of the infante, Don Carlos, but his father, Philip II, being left a widower, became fascinated and married her himself. She died in 1568. The stories of a romantic relationship existing between Elizabeth and Don Carlos are entirely groundless, but have furnished tragic subjects to Otway, Campistron, Chénier, Schiller and Alfieri.

Elizabeth Petrowna, Empress of Russia, daughter of Peter the Great and Catharine, born in 1709 or 1710, ascended the throne December 7, 1741, as the result of a conspiracy, in which Ivan VI, a minor, was deposed. Elizabeth is said to have rivaled her mother in beauty, and to have surpassed her in her love of pleasure, and her government was largely conducted by favorites. She was a patron of literature, founded the University of Moscow, and corresponded with Voltaire. A war with Sweden, in 1743, was advantageously concluded by the peace of Abo. She sent an army, in 1748, to assist Maria Theresa in the war of the Succession, and joined in the Seven Years' war against Prussia. She died in 1762, before this war was concluded.

Elizabethpol (ye-lyĕ-zä-vet-pol'), a town of Russia, in the Caucasus, capital of the government of same name, covering a great space of ground from the gardens and open areas it contains, but very unhealthy. Pop. 33,090.—The GOVERNMENT has an area of 16,721 sq. miles. It is partly mountainous, partly steppes, and produces grain, cotton, tobacco, wine, etc. Pop. (1906) 953,300.

Elizabeth Stuart, Queen of Bohemia, daughter of James I of England, and VI of Scotland. She was born in 1596, and died in 1662.

Elk, MOOSE, or MOOSE DEER (*Cervus alces* or *Alces Malchis*), the larg-

est of the deer family, a native of northern Europe, Asia and America. The American form (to which the name moose is usually given) is sometimes separated from the European as *Alces Americānus*, but most naturalists find no specific difference between them. The elk or moose has a short, compact body, standing about 6 feet in height at the shoulders, a thick neck; large, clumsy head, and horns which flatten out almost from the base into a broad, palmate form with numerous snags. In color the elk is grayish brown, the limbs, sides of head and coarse mane being, however, of a lighter hue. Their flesh resembles beef rather than venison. For the most they are inoffensive, and so exceedingly wary that they are approached only with difficulty. In America the Indians and half-breeds are the most skilful moose hunters. The moose has a wide range in Canada, extending from the Arctic Ocean and British Columbia to New Brunswick and Nova Scotia; and it is found also in Maine. It feeds largely on the shoots of trees or shrubs, such as the willow and maple, and on bark, etc. In Sweden its destruction is illegal, and in Norway there are many restrictions.

Head of Elk (*Cervus alces*).

Elk, IRISH (*Megacĕros hibernĭcus*), a large fossil deer found in the Pleistocene strata, and distinguished by its enormous antlers, the tips of which are sometimes 11 feet apart. Though a true deer, its antlers differ from those of living species in that the beam is flattened into a palm. To sustain the great weight, unusually large and strong limbs and neck vertebræ were required. Its remains are found not only in Ireland but in Scotland and England, and on the continent, where they occur in lacustrine deposits, brick clay and ossiferous caves.

El Kalif. See *Caliph*.

Elkhart (elk'hart), a town of Indiana, on the Elkhart River, 15 miles E. of South Bend. It has railroad has railroad shops and manufactures of carriages, harness, telephone supplies, scales, brass and iron goods, motor cars, etc. Pop. 21,745.

Elkins, a town of Randolph County, West Virginia, 7 miles N. of Beverly. It has lumber and tanning industries; also manufactures. Pop. 6500.

Elkins, STEPHEN B., an American statesman, was born in Ohio, in 1841; died in 1911. He was admitted to the bar in 1864 and went to New Mexico. He represented that territory in Congress, 1873-77. He later removed to West Virginia, became interested in mines and railroads, founded the town of Elkins, and in 1890 became Secretary of War. From 1895 to 1911 he was United States Senator from West Virginia.

Elks, BENEVOLENT AND PROTECTIVE ORDER OF, an association organized in New York, Feb. 16, 1868, by members of the dramatic profession for social purposes. Meetings are held on Sunday evenings, the business meeting being followed by a social session, which includes the drinking of a toast at precisely 11 o'clock: 'To our absent brothers.' In 1878 a charter was obtained for The Elks Mutual Benefit Association; 'for the relief of the sick and needy and the burial of the dead.' There is a ritual, grips and passwords as in the other secret benevolent societies. The order is rapidly growing, not now being confined to its former clientage, many other professional and business men being found in its ranks. The order is based upon the Constitution of the United States and is distinctively American.

Ellenborough (el'en-bu-ru), EDWARD LAW, LORD, an English lawyer, born in 1750 at Great Salkeld, Cumberland; educated at the Charter House and at Cambridge, and called to the bar in 1780. At the trial of Warren Hastings, in 1785, he acted as leading counsel. The defense did not come on until the fifth year of the trial, but after eight years Hastings was acquitted and Law's success assured. In 1801 he was made attorney-general, and in 1802 became Lord Chief-justice of the King's-bench, and was created baron. He held the office of chief-justice for fifteen years, resigning in 1818 in which year he died.

Ellenborough, EDWARD LAW, FIRST EARL OF, son of Lord Chief-justice Ellenborough (see above), born in 1790. He was educated at Eton and Cambridge, and in 1818, having succeeded his father as second baron, he entered the House of Lords. He took office in 1818 as lord privy-seal, and became president of the board of control in

1828-30, and again in 1834. In 1841 he accepted the governor-generalship of India, and arrived in Calcutta in 1842, in time to bring the Afghan war to a successful issue. The annexation of Scinde in 1843 was followed by the conquest of Gwalior, but the conduct of the governor-general gave dissatisfaction at home, and he was recalled early in 1844. On his return, however, he was defended by Wellington, and received the thanks of parliament, an earldom and the Grand Cross of the Bath. He then held the post of first lord of the admiralty (1845-46), and was president of the board of control from February to June, 1858. His despatch censuring the policy of Lord Canning as governor-general of India led to his resignation, and he never resumed office. He died in 1871.

Ellet (el'et), CHARLES, engineer, born at Penn's Manor, Pennsylvania, in 1810. His notable achievements were the construction of the wire suspension bridge over the Schuylkill, at Fairmount, Philadelphia (the first in America), and one over the Niagara River below the Falls. During the Civil war he became a colonel of engineers and built several steamers to use as rams on the Mississippi. He died in 1862, of a wound received in a naval battle at Memphis.

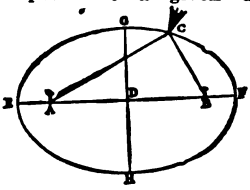
Ellichpur (el-ich-pör'), a town of India, in Ellichpur district, Berar, once a large and prosperous town. It has some trade in cotton and forest produce. Pop. 26,082.

Ellicott (el'i-kot), CHARLES JOHN, an English divine, born in 1819; educated at Cambridge. After being professor of divinity in King's College, London, Hulsean lecturer and Hulsean professor of divinity at Cambridge, and dean of Exeter, he was appointed bishop of Gloucester and Bristol in 1863. He was for eleven years chairman of the scholars engaged on the revision of the New Testament translation, and published commentaries on the Old and the New Testament, as well as numerous sermons, addresses, lectures, etc. He died in 1905.

Elliot, GEORGE AUGUSTUS. See *Heathfield.*

Elliott (el'i-ot), EBENEZER, an English poet, known as the 'Corn-law Rhymer' was born in 1781 near Rotherham, Yorkshire. At the age of seventeen he published his first poem, the *Vernal Walk*, which was soon followed by others. In 1829 the *Village Patriarch*, the best of Elliott's larger pieces, was published. From 1831 to 1837 he carried on business as an iron merchant, in Sheffield. His *Corn-law Rhymes*, periodically contributed to a local paper on behalf of the repeal of these laws, attracted attention and were afterwards collected and published with a longer poem entitled *The Ranter*. Commercial losses compelled him in 1837 to contract his business, and in 1841 he retired from it altogether, and died in 1849. In 1850 two posthumous volumes appeared, entitled *More Prose and Verse by the Corn-law Rhymer.*

Ellipse (e-lips'), a figure in geometry ranking next in importance to the circle, and produced when any cone is cut by a plane which passes through it not parallel to nor cutting the base. Kepler discovered that the paths described by the planets in their revolutions round the sun are ellipses, the sun being placed in one of the foci. To describe an ellipse:—At a given distance on the surface on which the ellipse is to be described fix two pins, A and B, and pass a looped string round them. Keep the string stretched by a pencil C, and move the pencil round, keeping the string at the same tension, then the ellipse E G F H will be described. A and B are the *foci*, D the center, E F the major axis, and G H the minor axis. D A or D B is the *eccentricity* of the ellipse. A line drawn from any point in the curve perpendicularly to the axis is an ordinate to the axis. Any straight line drawn through the center and terminated both ways by the curve is called a diameter.



Ellipse.

Ellipsis (e-lip'sis), in grammar, the omission of one or more words, which may be easily supplied by the connection.

Ellipticity (el-ip-tis'i-ti), OF THE EARTH, the deviation of the form of the earth from that of a sphere. See *Earth*, *Degree.*

Ellis (el'is), ALEXANDER JOHN, an English philologist, born in 1814 (name originally Sharpe). He was a distinguished graduate of Trinity College, Cambridge, was elected to the Royal Society in 1864, and became an influential member of the Philological Society, being more than once its president. Though phonetics was the subject in which he most highly distinguished himself, he was equally at home in mathematical and musical subjects. His chief published work was *Early English*

Pronunciation (parts i-iv, 1869–75); but his publications in the form of books, pamphlets, papers and articles on phonetics, music, mathematics, etc., were numerous. He died in 1890.

Ellis, HAVELOCK, English scientist, psychologist and literary critic, born at Croyden in Surrey, 1859. He has written a number of clerical and popular scientific works, chiefly essays. *Studies in the Psychology of Sex* (1897–1903), is the most pretentious work.

Ellis, WILLIAM, an English missionary born in 1794; died in 1872. He was sent out to the South Sea Islands in 1816 by the London Missionary Society, and returned in 1825, one result of his labors being *Polynesian Researches* (1829). In 1830–44 he was secretary to the society, and afterwards on its behalf made several visits to Madagascar, the longest being in 1861–65. These visits led him to publish *Three Visits to Madagascar, Madagascar Revisited,* and *The Martyr Church of Madagascar.*

Ellis Island, a small island in New York harbor, one mile southwest of Manhattan Island, and since 1829, the chief landing place for immigrants to the United States. Here immigrants must undergo inspection by the Federal Government before they can be admitted as residents; and from here undesirable aliens are deported.

Ellora (el-ō'ra), or ELO'RA, a ruinous village of Hindustan, Deccan, Nizam's dominions, 13 miles northwest of Aurangabad, famous for its rock and cave temples excavated in the crescent-

Kylas, Ellora.

shaped scarp of a large plateau. They run from north to south for about a mile and a quarter, and consist of five Jain caves towards the north, seventeen Brahmanical caves at the center, and towards the south twelve Buddhistic caves. Of the temples some are cut down through the rock, and left open above like isolated buildings, others are excavated under the hill in the manner of caves properly so called. The interior walls are often richly carved with mythologi l designs. The most magnificent of the whole is the Hindu temple called Kailas or Cailas, the central portion of which forms an isolated excavated mass or immense block 500 feet in circumference and 100 feet high. It is surrounded by galleries or colonnades at the distance of 150 feet in which the whole Hindu pantheon is cut in the perpendicular rock. Another fine temple, much smaller, but cut under the hill, is the Buddhist cave of Visvakarma, the only one excavated with a curved roof. The date of the caves is not certainly known, but they were probably the work of the reigning families at the neighboring Deoghir. The amount of labor involved in their construction must have been enormous.

Ellsworth (els'wurth), OLIVER, jurist, was born in Windsor, Connecticut, in 1745; died in 1807. He was a member of the Constitutional Convention of 1787 and was elected to the U. S. Senate in 1789. John Adams styled him 'the finest pillar of Washington's administration.' In 1796 he was appointed Chief Justice of the Supreme Court of the United States.

Ellwood (el'wŏd), THOMAS, an early writer among the Quakers, born in England in 1639. About 1660 he was induced to join the Society of Friends, and soon after published *An Alarm to the Priests.* He was imprisoned on account of his religion, but subsequently became reader to Milton, and is said to have suggested to him the idea of writing the *Paradise Regained.* In 1705 and 1709 he published the two parts of his *Sacred History.* His works include a poetical life of King David, the *Davideis.* He died in 1713.

Elm, a genus of trees (*Ulmus;* nat. order, *Ulmaceæ*), consisting of thirteen species, all natives of the northern temperate zone. They have bisexual flowers with a companulate calyx, as many stamens as there are divisions in the limb of the calyx, and two styles. The *U. campestris,* or common elm, is a fine tree, of rapid and erect growth, and yielding a tall stem, remarkable for the uniformity of its diameter throughout. It is a native of the south and middle of Europe and the west of Asia. The average height of a mature tree is 70

or 80 feet, but some reach 150 feet. The wood is brown, hard, of fine grain, not apt to crack, and is used for many purposes. The tree generally attains maturity in seventy or eighty years. *U. montana* (the mountain or *wych elm*), a native of Scotland, is of slower growth, and yields a much shorter bole, but it is far bolder in its ramification and more hardy. It usually attains to the height of about 50 feet. The most ornamental tree of the genus is *U. pendŭla*, the weeping elm. The American or white elm (*U. Americāna*) is abundant in the Western States, attaining its loftiest stature between lat. 42° and 46°; here it reaches the height of 100 feet, with a trunk 4 or 5 feet in diameter, rising sometimes 60 or 70 feet before it separates into a few primary limbs. Its wood is not much esteemed. The red or slippery elm (*U. fulva*) is found over a great extent of country in Canada, and the United States, as far south as lat. 31°; it attains the height of 50 or 60 feet, with a trunk 15 or 20 inches in diameter; the wood is of better quality than that of the white elm. The leaves and bark yield an abundant mucilage. The wahoo (*U. alāta*), inhabiting from lat. 37° to Florida, Louisiana and Arkansas, is a small tree, 30 feet high. The branches are furnished on two opposite sides with wings of cork 2 or 3 lines wide; the wood is finely grained and heavy.

Elmina (el-mē'na), a British town and seaport on the west coast of Africa, 5 or 6 miles west of Cape Coast Castle. It was acquired by Britain in 1872 along with the other Dutch possessions here. Pop. about 4000.

Elmira (el-mī'ra), a city of New York, county seat of Chemung Co., on the Chemung River; with a college for women, the State reformatory, fine courthouse, etc. Its manufactures include valves, fire engines, automobile parts, milk bottles, knitted and silk goods, etc. It has also extensive railroad car shops. Pop. 50,000.

Elmo's Fire (el'mōs), ST., a meteoric appearance often seen playing about the masts and rigging of ships. If two flames are visible (Castor and Pollux) the sailors consider it a good omen; if only one (Helena), they regard it as a bad one.

Elmshorn (elms'horn), a town of Prussia, Holstein, 20 miles northwest of Hamburg, on the Krückau, a navigable stream. It has trading interests and various manufactures. Pop. (1905) 13,640.

Elmsley (elms'li), PETER, an English scholar, born in 1773, and educated at Oxford. He was one of the original contributors to the *Edinburgh Review*, and wrote occasionally, at a subsequent period, in the *Quarterly*. He finally settled at Oxford, where he held the headship of St. Alban Hall and the Camden professorship of ancient history in 1823. He died in 1825. He published editions of the *Œdipus Tyrannus* (1811), *Heraclidæ* (1815), *Medea* (1818), *Bacchæ* (1821), and *Œdipus Coloneus* (1823).

El Obeid. See *Obeid.*

Elocution (el-u-kū'-shun), the art by which, in delivering a discourse before an audience, the speaker is enabled, with greatest ease and certainty, to render it effective and impressive. The value of an elocutionary training is very great, as well in sparing the voice as in overcoming natural defects or provincialisms in delivery, and in cultivating and developing the natural taste.

Eloge (ā-lōzh; French, eulogy), a discourse pronounced in public in honor of an illustrious person recently deceased, peculiarly a French institution.

Elohim (el-ō'him; plural of *Eloah*), one of the Hebrew names for God, of frequent occurrence in the Bible. Elohim is used in speaking both of the true God and of false gods, while Jehovah is confined to the true God. The plural form of Elohim has caused a good deal of controversy, some considering it as containing an illusion to the doctrine of the Trinity, others regarding it as the plural of excellence, others holding it as establishing the fact of a primitive polytheism. The Elohistic passages in the Pentateuch, or, in other words, the passages in which the Almighty is always spoken of as Elohim, are supposed to have been written at an earlier period than those in which he is spoken of as Jehovah. The Elohistic passages are simpler and more primitive in character than the Jehovistic; thus Gen., i, 27, is Elohistic; Gen., ii, 21-24, is Jehovistic.

Elopura (el-o-pū'ra), a seaport of British North Borneo, on Sandakan Bay. Pop. 8000.

El Paso (el-pā'so), a city, capital of El Paso County, Texas, on the Rio Grande, near the border of Mexico. It is the distributing and supply point for a vast mining, stock-raising and agricultural area, and has fine railway service. Pop., including Fort Bliss, 50,000. Altitude, 3760 feet.

Elphinstone (el'fin-stōn), MOUNTSTUART, born in Scotland in 1778. He joined the Bengal

civil service in 1795, was ambassador to the Afghan court in 1808, was resident at the court of Poonah from 1810 to 1817, and was British commissioner to that province from 1817 to 1819, when he became governor of Bombay. During a government of seven years he established a code of laws, lightened taxes, and paid great attention to schools and public institutions. He resigned in 1827. A college established by the natives was called after him Elphinstone College. He was the author of an *Account of the Kingdom of Cabul and its Dependencies* (1815) and a *History of India* (1841). He was offered the governor-generalship of India in 1835, and afterwards that of Canada, both of which he declined. He died in 1859.

Mountstuart Elphinstone.

Elphinstone, WILLIAM, a Scottish prelate, founder of King's College and University, Aberdeen, born at Glasgow in 1431. He was educated at Glasgow College, and served four years as priest of St. Michael's in that city. He then went to France and became professor of law, first at Paris and subsequently at Orleans, but about 1471-74 he returned home at the request of Muirhead, Bishop of Glasgow, who made him commissary of the diocese. In 1478 he was made commissary of the Lothians, and in 1479 Archdeacon of Argyle. Soon after he was made Bishop of Ross; and in 1483 was transferred to the see of Aberdeen. In 1484 and 1486 he was commissioned to negotiate truces with England, and in 1488 was lord high-chancellor of the kingdom for several months. He was next sent on a mission to Germany, and after his return held the office of lord privy-seal till his death in 1514. In 1494 he obtained a papal bull for the erection of the university of King's College at Aberdeen.

El Reno, a city, capital of Canadian County, Oklahoma, 30 miles N. W. of Oklahoma City. It has large roller mills and other factories, and ships produce and lumber. Pop. 7872.

Elsass. See *Alsace.*

Elsass-Lothringen (lōt'ring-ĕn). See *Alsace-Lorraine.*

Elsinore (el-si-nōr'; Danish *Helsingör*), a seaport of Denmark, in the island of Seeland, at the narrowest part of the Sound, here only 3½ miles broad, 24 miles north by east of Copenhagen, opposite Helsingborg in Sweden. Elsinore is defended by the castle of Kronborg, a Gothic-Byzantine edifice built about 1580, and commanding the Sound. It is now chiefly used as a prison. Before the abolition of the Sound dues in 1857 all merchant ships passing through were bound to pay toll here. Elsinore is the assumed scene of Shakespere's tragedy of *Hamlet.* Pop. 13,902.

Elster (el'ster), two German rivers, the White or Great Elster, a tributary of the Saale; the Black Elster, a tribuary of the Elbe.

Elswick (els'ik), a suburb of Newcastle, England, containing the great ordnance works of Armstrong & Co. Pop. 35,000.

Elutriation (e-lū'tri-ā-shun), the process of separating the finer particles of a clay, earth, or similar mass from the coarser, consisting in stirring up the substance in water, letting the coarser particles subside, running off the liquid containing the finer particles, and then waiting till they subside.

Elvas (āl'vash), a town of Portugal, province of Alemtejo, near the Spanish frontier, 12 miles northwest of Badajoz, on a height flanked by two others, each crowned by a castle. It has a cathedral, partly Moorish and partly Gothic, and a Moorish aqueduct, a magnificent work which brings water from a distance of 15 miles. Pop. 14,018.

Elves. See *Fairies.*

Elwes (el'wes), JOHN, an English miser, born about 1712. His own name was Meggot, but he changed it on succeeding to an estate left him

by his uncle, Sir Harvey Elwes. He was educated at Westminster School, and in his younger days was noted for his skill in horsemanship and love of the chase. He was elected member for Berks in 1774. His fortune and parsimonious habits increased in equal ratio, and at his death in 1789 he left half a million to his two natural sons.

Elwood (el'wood), formerly Quincy, a city of Madison Co., Indiana, 44 miles S. E. of Logansport. It is a shipping point for grain and live stock, and has glass and tin works, brick yards, planing mills, etc. Pop. 12,000.

Ely (ē'li), an episcopal city of England, in the county of Isle of Ely, on an eminence on the left bank of the Ouse. The ecclesiastical structures comprise the cathedral and the churches of St. Mary, and the Holy Trinity, the last, belonging to the time of Edward II, and one of the most perfect buildings of that age. The superb cathedral occupies the site of a monastery founded about the year 673 by Etheldreda, daughter of the king of East Anglia. Its entire length, east to west, is 517 feet, and its west tower is 270 feet high. A fine gateway, built in the reign of Richard II, forms the principal entrance to the cathedral precincts. There are few manufactures, most of the inhabitants being engaged in agricultural labor. Pop. (1911) 7917.

Ely, Isle of, a district in England, in the county of Cambridge, separated on the south by the Ouse from the remaining portion of the county. It is about 28 miles long by 25 miles broad; area, 355 square miles.

Ely, Richard Theodore, economist, born at Ripley, New York, in 1854. He became professor of political economy at Johns Hopkins University in 1881 and at the University of Wisconsin, in 1892. He has written *French and German Socialism, Taxation in American States and Cities, Trusts and Monopolies,* etc.

Elyria (e-lir'e-a), a city, capital of Lorain Co., Ohio, 25 miles W. of Cleveland, and 7 miles S. of Lake Erie, on Black River. It has good water power and varied manufactures. Pop. 14,825.

Elysium (e-li z h' i-u m), Elysian Fields, among the Greeks and Romans the regions inhabited by the blessed after death. They are placed by Homer at the extremities of the earth, by Plato at the antipodes, and by others in the Fortunate Islands (the Canaries). They were at last transferred to the interior of the earth, which is Virgil's notion. The happiness of the blessed consisted in a life of tranquil enjoyment in a perfect summer land, where the heroes, freed from all care and infirmities, renewed their favorite sports.

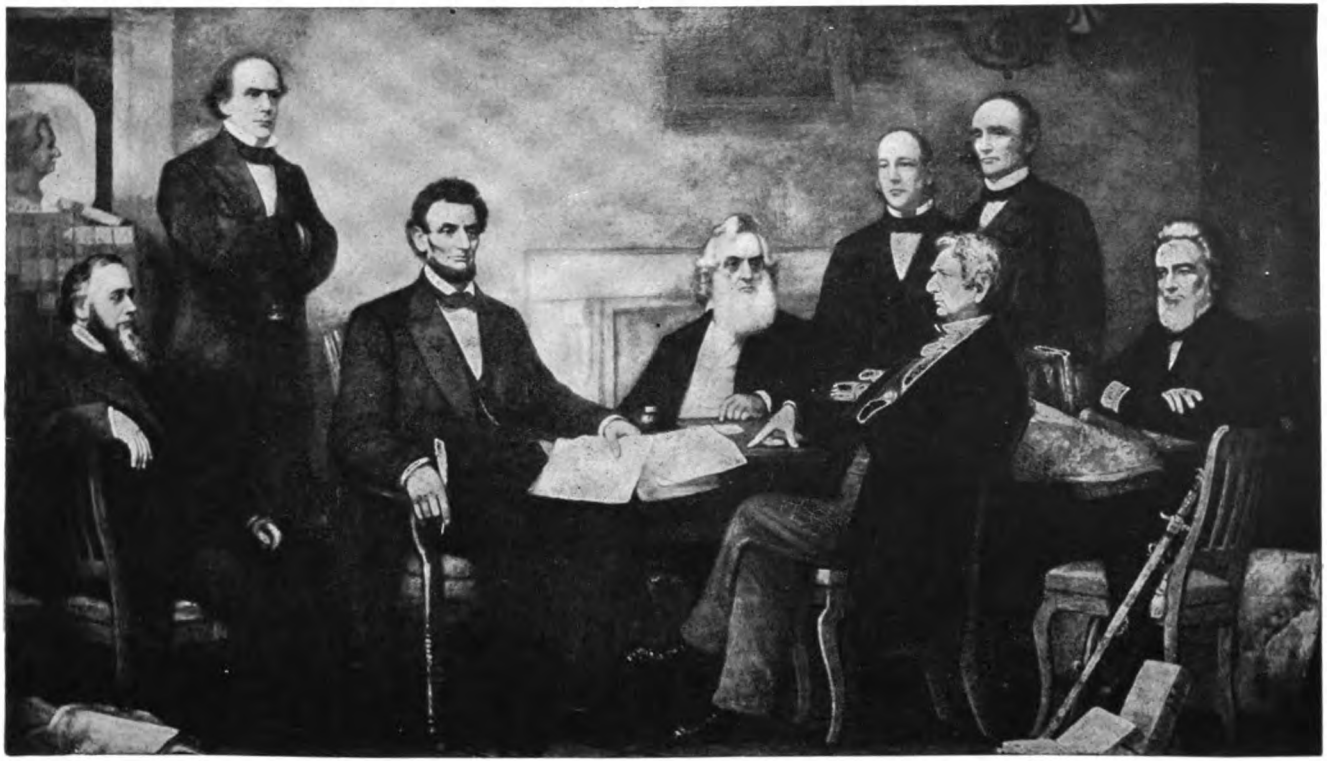
Elytra (el'i-tra), the hard, bony cases which enclose the wings of coleopterous insects, or beetles. They are themselves wings, but are less important for flight than for protecting the true wings when folded beneath them in a state of repose.

Elze (el'tse), Karl, a German writer, distinguished for his studies in English literature, born in 1821; died in 1889. He studied at Leipzig and Berlin, was long a teacher in the gymnasium of his birthplace, Dessau, and in 1875 was appointed to the chair of the English language and literature at Halle. Among his writings were valuable biographies of Sir Walter Scott and Lord Byron (the latter translated into English), and a biographical and critical work on Shakespere, also translated into English (1888).

Elzevir (el'ze-vir), or Elzevier, the name of a family of publishers and printers, residing at Amsterdam and Leyden, celebrated for the beauty of the editions of various works published by them, principally from 1595 to 1680. Louis, the founder of the family (born in 1540; died in 1617), settled in Leyden, and between 1583 and his death produced about 150 works. Five of his seven sons followed his business:—Matthæus at Leyden; Louis (II) at The Hague; Gilles at The Hague and afterwards at Leyden; Joost in Utrecht; and Bonaventure, who in 1626 associated himself with Abraham, the son of Matthæs. From the press of Abraham and Bonaventure issued the exquisite editions of the classics, etc., which have made the name of Elzevir famous. Of these the *Livy* and *Tacitus* of 1634, the *Pliny* of 1635, the *Virgil* of 1636 and the *Cicero* of 1642 are perhaps the most beautiful.

Emanation (em-a-nā'shun), in a specific sense, an idea at the center of many philosophic systems which seek to explain the universe as an eternal efflux or emanation from the Supreme Being, comparable with the efflux of light from the sun. Traces of the doctrine are found in the system of Zoroaster. It had a powerful influence on the ancient Egyptian and Greek philosophy.

Emancipation Proclamation (e-man-si-pā'shun), The, a state paper issued by President Lincoln, January 1,



FIRST READING OF THE EMANCIPATION PROCLAMATION TO THE CABINET

From left to right—Edward M. Stanton, Secretary of War (seated); Salmon P. Chase, Secretary of the Treasury (standing); President Lincoln and Gideon Welles, Secretary of the Navy (seated); Caleb B. Smith, Secretary of the Interior (standing); William H. Seward, Secretary of State (seated); Montgomery Blair, Postmaster-General (standing); and Edward Bates, Attorney-General (seated).

1863, 'as a fit and necessary war measure for suppressing rebellion.' It freed all slaves in any states and portions of states actually in rebellion, and which were unrepresented in Congress, or not in possession of the Union armies. Its practical result was the abolition of the system of slavery in the United States, since there were few slaves in the excepted areas. The whole of these were manumitted by subsequent legislation.

Emanuel (e-man'u-el), king of Portugal, ascended the throne in 1495. During his reign were performed the voyages of discovery of Vasco da Gama, Cabral and Vespucius, and the exploits of Albuquerque, by whose exertions a passage was found to the East Indies, the Portuguese dominion in Goa was established, and Brazil, the Moluccas, etc., were discovered. The commerce of Portugal, under Emanuel, was more prosperous than at any former period. The treasures of America flowed into Lisbon, and the reign of Emanuel was justly called 'the golden age of Portugal.' He died in 1521, aged fifty-two, deeply lamented by his subjects, but hated by the Moors and the Jews, whom he had expelled. He was a patron of learned men, and himself left memoirs on the Indies. He married three times: in 1497 Isabella, daughter of Ferdinand and Isabella, heiress of Castile; in 1500 her sister Maria; and in 1519 Eleonora of Austria, sister of Charles V.

Embalming (em-bäm'ing), the process of filling and surrounding with aromatic and antiseptic substances any bodies, particularly corpses, in order to preserve them from corruption. The ancient Egyptians employed the art on a great scale, and other peoples, for example the Assyrians and Persians followed them, but by no means equaled them in it. The ancient Peruvians appear to have injected and washed the corpses with the fluid that flows from imperfectly burned wood, which would of course contain pyroligneous acid, creasote and other antiseptics. Pliny alludes to the use of a similar fluid by the Egyptians for embalming. In later times, bodies have been preserved a long time by embalming, especially when they have remained at a low and uniform temperature, and have been protected from the air. The body of Edward I was buried in Westminster Abbey, in 1307, and in 1770 was found entire. Canute died in 1036; his body was found very fresh in 1776 in Winchester Cathedral. The bodies of William the Conqueror and Matilda his wife were found entire at Caen in the sixteenth century. That of Paul Jones, buried at Paris in 1792, was found in a state of excellent preservation and brought to America in 1905. Of the various modern artificial means of preserving bodies, impregnation with corrosive sublimate appears to be one of the most effective, next to immersion in spirits.

Embankment (em-bank'ment), a mound of earth, etc., thrown up either for the purpose of forming a roadway at a level different from that of the natural surface of the ground, or for keeping a large body of water within certain limits. The slopes should be adapted to the material, so as to secure permanence.

Embargo Act (em-bär'go), a measure adopted by the Congress of the United States in 1807, as a reprisal for England's prohibition of all commerce with France, a similar prohibition by France, blockades by each, and searches of neutrals by both. The act prohibited American vessels sailing from foreign ports, and foreign vessels taking cargoes from American ports. It was enforced until March 5, 1809, but proved unsuccessful, causing more distress in America than in the countries aimed at.

Embargo Act of 1917. An act of Congress by which, in June, 1917, the United States as a belligerent seeking to conserve its food supply as well as to prevent the provisioning of enemy countries through excessive shipments to neutrals, put in operation a general embargo, authorized by Article VII of the Espionage Act (*q. v.*). In accordance with the provisions of this act a qualified embargo was established by Presidential proclamation on July 9, forbidding the exportation from the United States to all the countries of the world, after July 15, 1917, of certain specified articles, notably fuels, grains, flour, ammunitions, iron, steel, etc. A second Presidential proclamation, issued Aug. 27, added a number of other commodities. This second proclamation also placed under government control and license the exportation of every article of commerce to the Central Powers, their allies, and the adjacent neutrals.

Embassy (em'ba-si), in its strict sense, signifies a mission presided over by an ambassador, as distinguished from a legation or mission entrusted to an envoy. An ambassador as the representative of the person of his sovereign, can demand a private audience of the sovereign to whom he is accredited, while an envoy must communicate with the minister for foreign affairs.

Embattled (em-bat'ld), in architecture and heraldry, having a form or outline like the battlements of a castle.

Ember-days (em'ber), in the Anglican and Roman Catholic churches, fast days occurring at the times in the year appointed for ordinations. As now observed, they are the Wednesday, Friday and Saturday after the first Sunday in Lent, after the feast of Pentecost or Whitsunday, after the festival of the Holy Cross (September 14), and after the festival of St. Lucia (December 13). The weeks in which these days fall are called *Ember-weeks*.

Ember-goose, a bird, known also as the great northern diver and loon. See *Divers*.

Emberizidæ (em-ber-iz'i-dē), a family of small birds belonging to the order Insessōres and tribe Conirostres, typical geneus *Emberiza*. It includes the buntings, the snow-flake, the yellow-hammer and reed sparrow. The ortolan belongs to this family. By some naturalists they are classified as a subfamily of the finches.

Embezzlement (em-bez'l-ment), in criminal law, consists in fraudulently removing and secreting personal property, with which the party has been entrusted, for the purpose of applying it to his own use. The moral guilt of embezzlement is often greater than that of larceny, and the laws against it are therefore justly severe.

Emblem (em'blem), specifically a picture representing one thing to the eye and another to the understanding. The most common emblems are such as a balance, which represents justice; a crown, an emblem of royalty; the serpent, of cunning, etc.

Emblements (em'ble-mentz), in law, the crops actually growing at any time upon land. They are considered in law as personal property, and pass as such to the executor or administrator of the occupier, if the latter die before he has actually cut, or reaped, or gathered the same.

Embolism (em'bu-lizm), the blocking up of a blood-vessel by a clot of blood that comes from some distance, till it reaches a vessel too small to permit its onward progress, often the cause of sudden paralysis and death, or of gangrene and pyæmia. See *Thrombosis*.

Embossing (em-bos'ing), the art of producing raised figures upon plane surfaces, such as on leather for bookbinding, etc.; on paper for envelopes, etc.; on wood or bronze, in architecture or sculpture.

Embracery (em-brā'ser-i), an attempt to corrupt or influence a jury by money, promises, letters, entertainments, persuasions, or the like.

Embrasure (em-brā'zhur), in fortification, an opening in the breastwork or parapet of a battery or fortress, to admit of a gun being fired through it.

Embrocation (em-bro-kā'shun), a lotion or combination of medicinal liquids, with which any diseased part is rubbed or washed.

Embroidery (em-broi'dėr-i), raised figured work in gold, silver, silk, cotton or thread, wrought by the needle, upon linen or other cloths. In embroidering a kind of stretching frame is used, because the more the piece is stretched the more easily it is worked. The art was common in the East in very ancient times. The Jews appear to have acquired it from the Egyptians; Homer makes frequent allusion to it; and Phrygia was celebrated for its embroidery, which was in great demand at Rome. The Anglo-Saxons had a continental reputation, and from the eleventh to the sixteenth century the art of pictorial needlework was of the highest importance both as a recreation and as an industry. Embroidery is commonly divided into two classes: white embroidery applied to dress and furniture, in which the French and the Swiss excel; and embroidery in silk, gold and silver, chiefly in demand for ecclesiastical vestments, etc. The Chinese, Hindus, Persians and Turks excel in work of this kind.

Embrun (ân-brûn), a picturesque walled town of France, dep. Hautes-Alpes, on a rocky eminence on the Durance. It was sacked successively by Vandals, Huns, Saxons and Moors, by the Protestants in 1573, and by the Duke of Savoy in 1692. It has a fine cathedral. Pop. of commune 3752.

Embryo (em'bri-ō), (1) in zoology, the earliest and rudimentary form in which any young animal appears, it may be the first rudiments of the animal in the womb, before the several members are distinctly formed, after which it is called the *fœtus*. (See next article.) (2) In plants the embryo is the rudimentary organism contained in the seed.

Embryology (em-bri-ol'o-ji), the branch of biology comprising the history of animals from the first appearance of organization in the

egg or ovum (the embryo stage) up to the attainment of the perfect form. The importance of the study partly depends upon the fact that the history of animals thus traced reveals the existence of structures which disappear at a later period, or become obscured by arrest of their development or by union with other parts, and permits us to follow the steps by which complex organs arise by the combination of simpler parts. Thus, points of affinity are detected between species and orders whose adult aspect is very unlike. As a systematic study embryology dates only from the nineteenth century, though Aristotle and Galen had considered the subject, and though Harvey and other later physiologists did much in the way of direct observation to lay the foundations of higher work.

Emden (em'den), a town of Prussia, province of Hanover, near the mouth of the Ems, occupying a low flat intersected by numerous canals. The principal building is the great church, built in 1455. The harbors, connected with the town by canals, are shallow. It exports grain, dairy produce, gin, etc., and has shipbuilding yards, and manufactures hosiery, leather, etc. Pop. (1905) 20,754.

Emerald (em'er-ald), a well-known gem of pure green color, somewhat harder than quartz specific gravity 2.67 to 2.73. It is a silicate of aluminium and the rare element glucinum or beryllium, which was detected in it by Vauquelin after it had been discovered by the same chemist in the beryl. Its color is due to the presence of chromium. Its natural form is either rounded or that of a short, six-sided prism. It is one of the softest of the precious stones, but is not acted on by acids. Emeralds of large size and at the same time free from flaws are rare; the largest on record is said to have been possessed by the inhabitants of the valley of Manta in Peru when the Spaniards first arrived there. It was as big as an ostrich egg, and was worshiped as the *mother of emeralds*. The ancients, who valued them, especially for engraving, are said to have procured them from Ethiopia and Egypt. The finest are now obtained from Colombia. The oriental emerald is a variety of the ruby, of a green color, and is an extremely rare gem. See *Beryl*.

Emerald Green, known also as SCHWEINFURTH GREEN, and by other names, a vivid light-green pigment, prepared from arsenate of copper, and used both in oil and water-color painting. It is extremely poisonous.

Emeritus (e-mer'i-tus), a term applied to a Roman soldier who had served out his time and been discharged on something resembling the modern pension. It is now applied to professors and others who have been relieved of the duties of their office on account of infirmity or long service and to whom is usually paid a retiring allowance.

Emerson (em'er-son), RALPH WALDO, poet and prose writer, born at Boston in 1803; died in 1882. He was graduated at Harvard in 1821, for five years taught in a school, and in 1829 became minister to a Unitarian church in Boston, but in 1832 resigned his charge. He spent the greater part of 1833 in Europe, and on his return began his career as a lecturer on various subjects,

Ralph Waldo Emerson.

in which capacity he acted for a long series of years. In 1835 he took up his permanent residence at Concord, Massachusetts, and in 1836 published a small volume called *Nature*. He was one of the original editors of the *Dial*, a transcendental magazine begun in 1840. Two volumes of his essays were published in 1841 and 1844, and his poems in 1846. His miscellaneous addresses had been published in England in 1844, and on visiting Great Britain in 1847 he was welcomed by a large circle of admirers. In 1850 he published *Representative Men;* in 1856, *English Traits;* in 1860, *The Conduct of Life;* in 1869, *May Day and Other Poems* and *Society and Solitude;* in 1871, *Parnassus*, a collection of poems; in 1876, *Letters and Social Aims*. Emerson showed certain similarities with Carlyle, of whom he was

a friend and correspondent. Their correspondence was published in 1883. He was one of the most original and influential writers that the United States has produced and is very highly regarded as the chief modern exponent of optimistic philosophy.

Emery (em'e-ri), an impure variety of corundum, of blackish or bluish-gray color, chiefly found in shapeless masses and mixed with other minerals. It contains about 82 per cent. of alumina, and a small portion of iron; is very hard; is infusible, and is not attacked by acids. The best emery is brought from the Levant, chiefly from Cape Emeri in Naxos. It also occurs in Spain, and in a few iron mines in Great Britain. It is employed in cutting and polishing precious stones; in smoothing the surface of the finer kinds of lenses preparatory to their being polished; in the polishing of marble; by cutlers, locksmiths, glaziers and other artisans. For all these purposes it is pulverized in large iron mortars or in steel mills, and the powder, which is rough and sharp, is carefully washed and sifted into eight or ten degrees of fineness. Emery-paper and emery-cloth are made by laying a thin coat of glue upon the fabric, and dusting the emery from a sieve of the required size.

Emesa (em'e-sa), an ancient town, now called *Hems* (which see).

Emetic (e-met'ik), any substance administered to induce vomiting. Emetics are most commonly administered to remove poisonous or indigestible substances from the stomach, or to clear the air passages of obstructive morbid material in cases of bronchitis, croup, etc. Ipecacuanha and sulphate of zinc are frequently given for these purposes, or, as a readily obtainable substitute, mustard stirred into water. They should, however, always be administered with caution, or serious injury to the system may result.

Emetine (em'e-tin), a peculiar vegetable principle obtained from ipecacuanha root. In a dose of 1-6 grain it acts as a powerful emetic, followed by sleep; in a dose of 1-200 to 1-507 grain it stimulates expectoration from the bronchial tubes.

Emeu, EMU (ē'mū), a large cursorial bird, *Dromaius Novæ Hollandiæ*, formerly dispersed over the whole Australian continent, but now almost extirpated in many districts. It is allied to the cassowary, but is distinguished by the absence of a 'helmet' on the top of the head. It nearly equals the ostrich in bulk, being thicker in the body, though its legs and neck are shorter. Its feet are three-toed (the ostrich has two toes), and dull, sooty-brown color, those about the

Emeu (*Dromaius Novæ Hollandiæ*).

neck and head being of a hairy texture. The wings are small and useless for flight but the bird can run with great speed, and emeu coursing as a sport is said to surpass that of the hare. The flesh of the young emeu is by some considered a delicacy. The emeu is a bird of the plain, the cassowary of the forest. It is easily tamed, and may be kept out of doors in temperate climates. It feeds on vegetable matter, fruits, roots, etc.

Emeu Wren (*Stipitūrus malachūrus*), a small Australian bird allied to the warblers, somewhat similar to a wren, but having the tail-feathers long, stiff and thinly barbed, similar to emeu feathers.

Emigration (em-i-grā'shun), the departure of inhabitants from one country or state to another for the purpose of residence. The prime cause of such removal is overpopulation, though it is often influenced by particular and temporary incidents, such as an industrial crisis, a religious or political movement, the creation of a new colony, the desire to escape from laws regarded as oppressive or from compulsory military service. In barbarous times a tribe having exhausted the tract on which it had established itself, naturally migrated to more tempting territory. In Greece the limited territories of the states rendered the occasional deportation of part of the inhabitants to form new colonies a necessity; while at Rome, where the land was held by a few proprietors, and the trades and professions mainly exercised by slaves, the larger part of the free population had few sources of income apart from the occupation of portions of conquered territory in Italy and elsewhere. During the middle ages emigration was to some extent stayed by the fact that

the feudal system confined the mass of the people to the soil or within the insuperable limits of a corporation. Emigration to America commenced with the settlement of Spanish America and of the English in Virginia and New England; after which the Dutch colonized New York, the Swedes Delaware, the Quakers and Germans Pennsylvania, the French Canada and Louisiana. (See *Colony.*) Emigration from Britain was slow until 1815, when its rapid increase at first occasioned some alarm. The annual emigration, only 2081 in 1815, rose in 1847 to over a quarter of a million, while in the five years 1849-53 the average annual emigration was not less than 323,000. Since then the number has diminished, though not greatly, but it is nearly balanced by the number of immigrants. Other European countries have sent out large numbers of emigrants, especially Germany, the Scandinavian countries and Italy, Germany being second in numbers only to the United Kingdom. More recently the people of Austria-Hungary, Russia and Italy have become very active in emigration, each numbering several hundred thousand yearly. See *Immigration.*

Emigrés (ā-mi-graz), a name given more particularly to those persons who left France at the commencement of the first French revolution. At the head of these emigrants stood the royal princes of Condé, Provence and Artois, the first of whom collected a part of the fugitives to coöperate with the allied armies in Germany for the restoration of the monarchy. At Coblentz a particular court of justice was established to settle causes relating to the French *émigrés.* The corps of Condé was finally taken into the Russian service, and was disbanded in the Russian-Austrian campaign of 1799. When Napoleon became emperor he granted permission to all but a few of the emigrants to return to their country; but many declined to return until after his downfall. By the charter of 1814 they were shut out from the recovery of their estates and privileges.

Eminent Domain, the original ownership retained by the state, by which land or other private property may be taken for public use or benefit. If the authorities propose to set apart land for any lawful purpose, and the owner refuses to sell, or asks an unreasonable price, process may be issued from court to compel the surrender of the property. The constitution of the United States limits the exercise of this right to cases where the public good demands it, and requires compensation to those from whom the property is taken.

Emin Pasha. See *Schnitzer, Eduard.*

Emir (em'ēr), the title given by Mohammedans to independent chiefs or princes, *Amir* or *Ameer* being the same word. Thus the caliphs style themselves *Emir-al Mumenin,* Prince of the Faithful. *Emir-al Omrah,* Prince of Princes, is the title of the governors of the different provinces. The title is also given in Turkey to all the real or supposed descendants of Mohammed, through his daughter Fatimah.

Emmanuel Movement. See *Psychotherapy* and *Worcester.*

Emmenagogues (em-men'a-g o gz), medicines tending to promote menstruation.

Emmerich (em'e-ri*h*), a walled town of Rhenish Prussia, on the right bank of the Rhine, 5 miles N. E. of Cleves. It carries on an active trade chiefly with Holland. Pop. 12,578.

Emmet (em'et), ROBERT, an Irish patriot (born at Dublin in 1778. He withdrew from Trinity College, Dublin, in 1798 as a protest against the inquisitional methods of Lord Clarendon. Later having become an object of suspicion to the government, he quitted Ireland. He returned there on the repeal of the suspension of the Habeas Corpus Act, and became a member of the Society of United Irishmen for the establishment of the independence of Ireland. In July, 1803, he was the ringleader in the hopless rebellion in which Lord Kilwarden and others perished. He was arrested a few days afterwards, tried and executed. His fate excited special interest from his attachment to Sarah Curran, daughter of the celebrated barrister.

Emmons, SAMUEL FRANKLIN, geologist, was born at Boston, Massachusetts, in 1841. He became geologist on the United States Geology Survey in 1867 and long retained that position. He wrote numerous works on the geology and metallic deposits of the West, and also many papers on this and cognate subjects. He died March 28, 1911.

Emollients (e-mol'i-ents), medicines of an oleaginous, saponaceous, or emulsive character, applied to surfaces, generally external, to soothe and allay any tendencies to irritation or inflammation, etc.

Emotion (e-mō'shun), a term variously used by psychologists; sometimes as one of the divisions of feeling, the other being sensation; some-

times as opposed to feeling when the latter is identified with sensation, and sometimes as distinct from both sensation and feeling, when the last term is rigidly confined to the sense of pleasure or pain. In any of these uses, however, emotions are distinguished from sensations in that sensations are primary forms of consciousness arising by external excitation, are comparatively simple and immediately presentative phenomena, and are definite in character and capable of localization; while emotions are secondary or derived forms of consciousness, are complex and representative, and are vague and diffused. Sensations are said to be 'peripherally initiated,' while emotions are centrally initiated. When, in addition to its being distinguished from sensation, it is also distinguished from feeling, emotion is applied to the whole psychical condition accompanying the sense of pleasure or pain (feeling). The muscles of the body and the organic functions of the system are often considerably influenced by emotion, which naturally seeks an outward expression unless held in check by what Darwin has called serviceable associated habits.

Empannel (em-pan'el), to enter the names of the jurors into a schedule, roll, or page of a book, called the panel.

Empedocles (em-ped'o-klēz), a Greek philosopher of Agrigentum, in Sicily, born about 460 B.C. He is said to have introduced the democratic form of government in his native city, and the Agrigentines regarded him with the highest veneration as public benefactor, poet, orator, physician, prophet and magician. Aristotle states that he died in obscurity at the age of sixty years, in the Peloponnesus; but he is also said to have thrown himself into the crater of Mount Etna, in order to make it be believed, by his sudden disappearance, that he was of divine origin. According to Lucian, however, his sandals were thrown out from the volcano, and the manner of his death revealed. Empedocles holds earth, water, fire, air, as the four fundamental and indestructible elements from whose union and separation everything that exists is formed. To these material elements are added the two moving or operative principles of love and hatred, or attraction and repulsion.

Emperor (em'pėr-ur; from the Latin *imperātor;* in German, *Kaiser*, from *Cæsar*), the title of the highest rank of sovereigns. The word *imperātor*, from *imperāre*, to command, in its most general sense signified the commander of an army. After the overthrow of the Roman republic, *imperator* became the title of the rulers or emperors, and indicated their supreme power. Victorious generals were still, however, sometimes saluted with the title *imperator*, in its original sense. With the fall of Rome the title was lost in the West, but was kept up in the Eastern or Byzantine Empire for nearly ten centuries. In 800 it was renewed in the West when Charlemagne was crowned, by Leo III, as 'Carolus Augustus, the God-sent pious and great emperor of Rome.' It was however, for many centuries considered necessary to be crowned at Rome in order to be formally invested with the title of *emperor*. The imperial dignity became extinct in the East after the conquest of Constantinople in 1453, but the title was adopted by Peter I of Russia in 1721. Napoleon I adopted the old idea of an empire as a general union of states under the protection, or at least political preponderance, of one powerful state; and he was followed in this by his nephew, Napoleon III. In 1806 the first German Empire, 1000 years old, became extinct, and the German Emperor, Francis II, adopted the title of Francis I, emperor of Austria. In December 1870, the second German Empire was formed, King William of Prussia having accepted the imperial office and title offered him at Versailles while engaged in the siege of Paris. Britain is considered as an empire, the crown as imperial, and the parliament is styled the *Imperial Parliament of Great Britain and Ireland;* but the sovereign has not the imperial title in reference to the home dominions, though he bears the title of Emperor of India. The sovereigns of China, Japan and Morocco are often though with little propriety, called *emperors.*

Emperor Moth (*Saturnia pavonia minor*), a British moth of the silkworm family. The color is grayish brown, with a faint purple tinge. The wings are about 3 inches in expanse, and in the center of each is a large eye-like spot. The larva is of a green color, with a black band on each segment.

Empetraceæ (em-pe-trā'se-ē), a small nat. order of heath-like exogenous plants, of which the type is the crowberry.

Emphasis (em'fa-sis), in rhetoric, a special stress or force given to some syllable, word or words

in speaking, in order to impress the hearers in some desired manner, thus differing from *accent*, the position of which is fixed.

Emphysema (em-fi-sē'ma), in medicine, an inflation of some part of the body by the introduction of air into the cellular tissue, as from an injury to the trachea or lungs.

Empire (em'pīr), the dominions of an emperor (which see).—*Empire State*, a name given to New York State, New York city being occasionally called the *Empire City*.

Empiric (em-pir'ik), in medical history (from the Greek word *empeiria*, experience), an appellation assumed by a sect of physicians who contended that observation and experience alone were the foundation of the art of medicine. An empiric, in modern medicine, is a physician who has no regular professional education, but who relies on what is frequently a very crude experience.

Employers' Liability, the liability of employers to make compensation to workmen (or their families in the event of death) for injuries sustained in the course of their employment. In most of the United States this liability is not statutory, but is determined by a suit for damages, which can be recovered only when the jury finds that the employer was negligent and that negligence on his part caused the accident. If the employer can show contributory negligence on the part of the injured workman, he is exempt from liability. The essential principle of practically all foreign systems of accident indemnity is more generous, providing that whether or not the workman's negligence has been contributory, he shall become a pensioner of the industry that maimed him. The labor unions of the United States and social workers are endeavoring to secure more adequate legislation.

Empoli (ām'po-lē), a town in North Italy, on the left bank of the Arno, 16 miles w. s. w. of Florence; has an old collegiate church with good paintings, and manufactures of straw bonnets, etc. Pop. 7005.

Emporia (em-pō'ri-a), a city, capital of Lyon Co., Kansas, 61 miles s. s. w. of Topeka. It is the center of a fine agricultural district, and has iron, lumber and flour mills. It contains a State normal school. Pop. 9058.

Emporium (em-pō'ri-um; Greek, *emporion*, a mart, from *emporos*, a merchant), a center of extensive commerce, a trading town or city.

Empyema (em-pi-ē'ma), in medicine, a collection of pus or morbid matter in some cavity of the body, especially in the cavity of the pleura or chest.

Empyreuma (em-pi-rō'ma), the smell arising from organic matter when subjected to the action of fire, but not enough to carbonize it entirely. The products of imperfect combustion, as from wood heated in heaps or distilled in closed vessels, are frequently distinguished as empyreumatic.

Ems (āms, or emz), a beautiful watering place in the Prussian province of Hesse-Nassau, on the river Lahn, not far from its confluence with the Rhine. Its mineral waters are warm—from 70° to 118° Fahr., contain large quantities of carbonic acid gas, and are used in chronic catarrhs, pulmonary complaints, diseases of the stomach, gout and some diseases of the urinary vessels. There are about 8000 visitors each season. Pop. 6500.

Ems, a river of Northwest Germany, which flows northwest through Rhenish Prussia and Hanover, and falls into the Dollart Estuary near Emden; length 230 miles.

Emu. See *Emeu*.

Emulsin (e-mul'sin), or SYNAPTASE, an albuminous or caseous substance of which the white part of both sweet and bitter almonds chiefly consists; discovered by Liebig and Wölder.

Emulsion (e-mul'shun), a medical preparation, consisting of an oily or resinous substance made to combine with water by some substance that itself has the property of combining with both, such as gum arabic, the yolk of eggs, almonds, etc.

Emys (ē'mis), a genus of tortoises, type of the family Emydidæ, which includes the terrapins of America and others.

Enaliosaurians (en-a-li-ō-sa'ri-anz; 'sea-lizards'), the group of gigantic extinct reptiles of which the ichthyosaurus and plesiosaurus were the chief.

Enamel (en-am'el), a vitreous glaze of various colors fused to the surface of gold, silver, copper and other substances. The art of enameling, which is of great antiquity, was practiced by both the Assyrians and the Egyptians, from whom it may have passed into Greece, and thence into Rome and its

provinces, including Great Britain, where various Roman antiquities with enameled ornamentation have been discovered. The enameled gold cup given by King John to the corporation of Lynn, in Norfolk, proves that the art was known among the Normans. The Byzantines of the tenth century produced excellent *cloisonné* enamels on a gold base, the *cloisonné* process consisting in tracing the design in fillets of gold upon the gold plate and filling up the small molds thus formed with enamels, the design appearing in colored enamels, separated by thin gold partitions or *cloisons*. In some cases, however, the enamels were filled into hollows beaten out in the gold plate, which formed part of the field. In the twelfth century the town of Limoges acquired the high reputation for inlaid enamels which it held till the fourteenth century, and reacquired in the sixteenth for its painted enamels. The costliness of the sculptured ground had led the Italians early in the fourteenth century to substitute the practice of incising the design on the face of the plate, and then covering it with a transparent enamel. The further step, which made the Limousin workshops famous, consisted in the method of superficial enameling, in which opaque colors, or colors laid on a white, opaque ground, were used. The Limoges school degenerated greatly in the seventeenth century, but its method with certain modifications in detail is still employed. The basis of all kinds of enamel is a perfectly transparent and fusible glass, which is rendered either semitransparent or opaque by the admixture of metallic oxides. White enamels are composed by melting the oxide of tin with glass, and adding a small quantity of manganese or phosphate of calcium to increase the brilliancy of the color. The addition of the oxide of lead, or antimony, or oxide of silver, produces a yellow enamel. Reds are formed by copper, and by an intermixture of the oxides of gold and iron. Greens, violets and blues are formed from the oxides of copper, cobalt and iron. In the middle of the last century enameling was largely applied to the decoration of snuff-boxes, tea-canisters, candlesticks and other small articles. Of late years it has been extensively applied to the coating of iron vessels for domestic purposes, the protection of the insides of baths, cisterns and boilers, and the like. Enameling in colors upon iron is now common, iron plates being thus treated by means of various mixtures, and words and designs of various kinds being permanently fixed upon them by stenciling, for advertising, sign boards, etc.

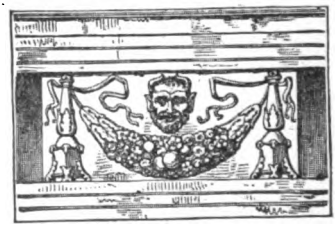
Enara (e-nä're), a lake of Russia, in the north of Finland, about 50 miles long by 30 miles broad. It is studded by innumerable islets, receives several streams, and is connected by the Patsjoki with the Arctic Ocean. At its southwest extremity is a small fishing town of the same name, with an annual fair.

Enarea (en-a-rē'a), a region belonging to the country of the Gallas, south from Abyssinia. Sakha is the chief town. Coffee and ivory are the chief exports. The inhabitants are the most civilized of the Gallas. Pop. 40,000.

Enarthrosis (en-ar-thrō'sis), a ball-and-socket joint.

Encampment (en-kamp'ment). See *Camp*.

Encarpus (en-k ä r'pus), in architecture, a sculptured ornament in imitation of a garland of fruits, leaves or flowers, suspended between two points. The garland is of greatest size in the middle, and diminishes gradually to the points of suspension, from which the ends generally hang down. The encarpus is sometimes composed of an imitation of drapery similarly disposed, and sometimes of an assemblage of musical instruments, implements of war or of the chase.



Encarpus, from Palazzo Niccolini, Rome.

Encaustic Painting (en-kas'tik), a kind of painting practiced by the ancients, for the perfecting of which heating or burning in was required. Pliny distinguishes three species, in all of which wax was used along with colors. The art has been revived in modern times, but has not been greatly employed. As the thing chiefly regarded in encaustic painting was the securing of permanence and durablity by the application of heat, the word *encaustic* has been applied to other and widely different processes.

Thus it has been used for painting on earthen vessels, for painting on porcelain and work in enamel; and in the same way it was given to the painting on glass of the middle ages. (See next article.)

Encaustic Tiles, ornamental paving tiles of baked pottery, much used during the middle ages in the pavements of churches and other ecclesiastical edifices. The encaustic tile, strictly so called, was decorated with patterns formed by different colored clays inlaid in the tile and fired with it. The art appears to have originated in the latter part of the twelfth century, to have attained its highest perfection during the thirteenth, and to have sunk into disuse in the fifteenth. During the whole of this period it was principally carried on in England and Normandy. After a long lapse the art was revived in England in 1830 by Wright, a Shelton potter. In modern manufacture two methods are employed, the 'plastic' and the 'semi-dry' or 'dust' method. The first is, in all essentials, that used in the middle ages, except, perhaps, in the perfection of modern molding appliances; the second consists in ramming pulverized clay with a minimum of moisture into metal dies, the subsequent firing of tiles thus consolidated being attended with less risk from shrinkage.

Enceinte (åṇ-saṇt), in fortification, the continuous line of works which forms the main enclosure of a town or fortress. The term is also applied to the area within this line.

Encenia (en-sē'ni-a), festivals anciently commemorative of the founding of a city or the dedication of a church; and in later times periodical ceremonies, as at Oxford, in commemoration of founders and benefactors.

Encephala (en-sef'a-la), that division of the Mollusca characterized by possessing a distinct head, and comprising the Gasteropoda, Pteropoda and Cephalopoda.

Encephalitis (en-sef-a-lī'tis), inflammation of the brain.

Encephalon (en-sef'a-lon), a term for the brain and whole nervous mass included in the skull.

Enchanter's Nightshade (enchant'ers), a name common to plants of the genus *Circæa*, nat. order Onagraceæ. *C. lutetiāna* is common in the United States from Carolina to Illinois, and *C. alpina* farther north. The former is about a foot and a half high, and has delicate ovate leaves; small, white flowers tinged with pink, and small, roundish seed-vessels covered with hooked bristles. It abounds in shady woods. *C. alpina* is similar, but smaller and more delicate. Both species are common in parts of Europe.

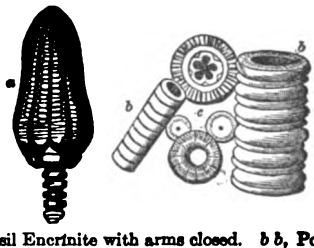
Enchasing (en-chās'ing), the art of producing raised or indented ornamental figures and designs upon metallic surfaces. See *Chasing*.

Enchorial Writing (en-kō'ri-al), the form of writing used by the old Egyptians for the common purposes of life, as distinct from the hieroglyphic and hieratic (used by the priests). Called also *Demotic*.

Encke (en'ke), JOHANN FRANZ, a German astronomer, born at Hamburg, in 1791. He studied under the astronomer Gauss at Göttingen. During the war of liberation (1813-15) he served as an artillerist in the German army, and after the peace became assistant in the observatory of Seeberg, near Gotha. Here he calculated the orbit of the comet observed by Mechain, Miss Herschel and Pons, predicted its return, and detected a gradual acceleration of movement, ascribed by him to the presence of a resisting medium. The comet is now known as Encke's comet. (See *Comets*.) The fame of his works *Die Entfernung der Sonne* ('The Distance of the Sun') and *Der Venusdurchgang von 1769* ('Transit of Venus of 1769') led to his appointment as director of the Berlin Observatory (1825), a position which he held till his death in 1865.

Enclave (åṇ-klåv), a term used in German and French to denote a place or country which is entirely surrounded by the territories of another power. Thus, several petty duchies and principalities are enclaves of Prussia.

Encrinite (en'krin-īt), a name often applied to all the marine animals of the order Crinoidea or stone-



a, Fossil Encrinite with arms closed. b b, Portions of the Encrinite stem. c, Separate joints.

lilies, class Echinodermata, but more specifically restricted to the genera having rounded, smooth stems attached to the

bottom, and supporting the body of the animal, which has numerous jointed arms radiating from a central disc, in which the mouth is situated. Encrinites were exceedingly numerous in past ages of the world's history; of those still existing our knowledge has been greatly increased of recent years through deep-sea dredging. Some of these forms are very graceful and interesting. See also *Crinoidea*.

Encyclical (en-sik'lik-al), a letter addressed by the pope to all his bishops, condemning certain errors, or giving advice regarding important public questions. It differs from a Bull in the fact that the latter is more special in its destination.

Encyclopedia (e n-s I-k l o-p ē'd i-a) CYCLOPÆDIA, or CYCLOPEDIA (Greek *en*, in, *kyklos*, a circle, and *paideia*, instruction), a systematic view of the whole extent of human knowledge or of particular departments of it with the subjects arranged generally in alphabetical order. Varro and Pliny the elder, among the Romans, attempted works of an encyclopedic nature, the latter in his well-known *Historia Naturalis* or *Natural History*. Other ancient encyclopedic works were those of Stobæus and Suidas, and especially of Marcianus Capella. In the thirteenth century a work on a regular plan was compiled by the Dominican, Vincent of Beauvais (d. 1264), in which was exhibited the whole sum of the knowledge of the middle ages. His work was entitled *Speculum Historiale, Naturale, Doctrinale*, to which an anonymous author added, some years later, a *Speculum Morale*. Roger Bacon's *Opus Majus* also belonged to the encyclopedic class. An exceedingly popular work was the *De Proprietatibus Rerum* of Bartholomeus de Glanvilla, an English Franciscan friar, which maintained its reputation from 1360 to the middle of the sixteenth century. In the seventeenth century various encyclopedic works were compiled, such as the Latin one of Johann Heinrich Alsted (in 7 vols., Herborn, 1620). In 1674 appeared the first edition of Moreri's *Le Grand Dictionnaire Historique;* in 1677 Johann Jacob Hoffmann published at Basel his *Lexicon Universale;* and in 1697 appeared Bayle's famous *Dictionnaire Historique et Critique*, which is still of great value. The first English alphabetical encyclopedia was the *Lexicon Technicum* published in 1704. Among the chief English works of this kind are: *Ephraim Chambers' Cyclopedia*, or a *Universal Dictionary of Arts and Sciences*, published in 1728; the *Encyclopedia Britannica*, published in Edinburgh, in eleven editions—the first in 1768, the last in 1911; *Rees' Cyclopedia*, 1802-20; *Edinburgh Encyclopedia*, 1810-30; *The London Encyclopedia*, 1829; *The Penny Cyclopedia*, 1833-43, and *Chambers' Encyclopedia*, 1860-68, second edition, 1888-92.

The larger American encyclopedias are the *Encyclopedia Americana*, 1829-33; the *New American Cyclopedia*, 1858-63 and 1881; Johnson's *Universal Cyclopedia*, 1874-77, and of more recent date the *New International Encyclopedia*, 20 vols., and the *Encyclopedia Americana*, 16 vols. Of the French encyclopedias the most famous is the great *Dictionnaire Encyclopédique*, by Diderot and D'Alembert (see next article); the *Encyclopédie Méthodique, ou par Ordre des Matières*, 1781-1832; the *Encyclopédie Moderne*, 1824-32; the *Encyclopédie des Gens du Monde*, 1835-44; the *Dictionnaire de la Conversation et de la Lecture*, 1851-58; and the large and valuable *Grand Dictionnaire Universel du XIX Siècle*, edited by Larousse. Numerous works of this kind have been published in Germany, the most popular being the *Conversations-Lexikon* of Brockhaus; Meyer's *Konversations-Lexikon;* Pierer's *Konversations-Lexikon*, and that issued by Spamer. The most comprehensive is the *Allgemeine Encyklopädie*, originally edited by Professors Ersch and Gruber. In addition to the works mentioned many others have been issued of smaller size, the articles, while little less numerous, being condensed, and adapted to the purposes of the busy reader. As a good example of these may be mentioned the present work. In addition to the general works mentioned, there are many of special character and several dictionaries with encyclopedic information, such as the English *Encyclopedic Dictionary* and the American *Century Dictionary and Encyclopedia*.

Encyclopédie (äṅ-sik-lo-pā-dē), THE FRENCH, the most important literary work of the eighteenth century after the works of Voltaire and Rousseau, originated in a French translation of *Ephraim Chambers' Cyclopedia*. Diderot was appointed to edit it, and enlisted the ablest men of the time as contributors. D'Alembert (who wrote the famous *Discours préliminaire*) edited the mathematics; Rousseau wrote the musical articles; Daubenton, those connected with natural history; the Abbé Yvon, those on logic, metanhysics and ethics; Toussaint, those on jurisprudence; Buffon contributed the article Nature; and Montesquieu, Voltaire,

Euler, Marmontel, D'Holbach, Turgot, Grimm and Condorcet took some share in the great work. Diderot himself was a prolific contributor on a wide variety of topics. The prospectus appeared in November, 1750, and the first volume in 1751, the whole being completed, despite fierce opposition in 1765.

Endecagon (en-dek'a-gon), a plane figure of eleven sides and angles.

Endemic (en-dem'ik; Greek, *en*, and *dēmos*, people), a name commonly applied to diseases which attack the inhabitants of a particular district or country, and have their origin in some local cause, as the physical character of the place where they prevail, or in the employments, habits and mode of living of the people. Diseases which are endemic in one country may also appear in others, and become epidemic under influences resembling those which are the causes of the endemic in the former place.

Enderby Land (en'der-bi), an island in the Antarctic Ocean, long. 50° E., crossed by the Antarctic Circle.

Endive (en'div), a plant, *Cichorium Endivia*, nat. order Compositæ, a native of Asia, introduced into Britain in 1548, and cultivated for culinary purposes. It has large, sinuate, smooth, toothed, or finely curled, deep-green leaves, which, when blanched, are used in salads, soups, etc. Chicory or succory is *C. Intybus*.

Endless Screw (end'les), a mechanical contrivance, consisting of a screw, the thread of which gears into a wheel with skew teeth, the obliquity corresponding to the angle of pitch of the screw. It is generally employed as a means of producing slow motion in the adjustments of machines, rather than as transmitter of any great amount of power.

Endlicher (end'li-*h*ĕr), STEPHEN LADISLAUS, an Austrian botanist, etc., born at Presburg in 1804. He was successively court-librarian at Vienna, and keeper of the natural history museum; and in 1840 was appointed professor of botany in the University of Vienna, and director of the botanic garden, which he immediately began to reorganize. He took part on the popular side in the German revolution of 1848, and died by his own hand in 1849. Among his chief botanical works are his *Genera Plantarum*, a systematic treatise on botany; and his *Enchiridion Botanicum* or *Manual of Botany*.

Endocarditis (en-dō-kar-dī'tis), the inflammation of the endocardium or serous membrane covering the valves and internal surface of the heart.

Endogamy (en-dog'a-mi; Greek, *endon*, within; *gamos*, marriage), a custom among some savage peoples of marrying only within their own tribe; opposite to *exogamy*.

Endogenous Plants (en-doj'e-nus), or ENDOGENS (Gr. *endon*, within; *gen*, to produce), one of the large primary classes into which the vegetable kingdom is divided, so named in consequence of the new

1. Section of the stem of a Palm: *c*, Portion of stem, natural size, showing the ends of the bundles of woody fiber; *e*, Remains of leaf-stalks; *f*, Bundles of woody fiber. 2, Endogenous Leaf showing its parallel veins. 3, Monocotyledonous Seed, showing its single cotyledon: *a a*, Cotyledon. 4, Germination of Palm; *c*, Cotyledon; *b*, Albumen; *d*, Plumule; *e*, Radicle issuing from a short sheath, endorhiza. 5, Flower of Endogen.

woody bundles being developed in the interior of the stem, in which there is no distinction of pith and bark. In transverse section these bundles appear scattered through the cellular matter, being more compact towards the circumference. The other organs of the plants are also characteristic. The leaves are generally parallel-veined, the flowers usually with three organs in each whorl, the seed has an embryo with one cotyledon, and the radicle issues from a sheath and is never developed into a tap-root in germination. To this class belong palms, grasses, rushes, lilies, etc. Endogens increase in thickness only to a limited extent; hence they are not injured by twining plants as exogens are.

Endomorph (en'du-morf), a term applied to minerals enclosed in crystals of other minerals.

Endoparasite (en-dō-par'a-sīt; Greek *endon*, within), a parasite living on the internal organs of ani-

mals, as opposed to an *ectoparasite*, which infests the skin.

Endorhiza (en-dō-rī'za), in botany, a term descriptive of the radicle of the embryo of monocotyledonous plants, which is developed inside a sheath (Gr. *endon*, within, *rhiza*, a root) from which it issues in germination. The cut shows the germinating embryo of the oat.

Endorhiza.

Endoskeleton (en-dō-skel'e-tun), in anatomy, a term applied to the internal bony structure of man and other animals (Greek, *endon* within), in contradistinction to *exoskeleton*, which is the outer and hardened covering of such animals as the crab, lobster, etc.

Endosmose, or ENDOSMOSIS (en'dos-mōs, en-dos-mō'sis), the transmission of fluids or gases through porous septa or partitions from the exterior to the interior of a vessel. An instrument for measuring the force of endosmotic action is known as an endosmometer.

Endosperm (en'do-sperm), the tissue surrounding the embryo in many seeds and which is contained with it within the testa. It contains the supply of food for the germinating embryo, and is also called albumen or perisperm.

Endymion (en-dim'i-on), a personage of Greek mythology, according to various accounts a huntsman, a shepherd, or a king of Elis, who is said to have asked of Zeus, or to have received as a punishment, eternal sleep. Others relate that Selēnē or Diana (the moon) conveyed him to Mount Latmos in Caria, and threw him into a perpetual sleep in order that she might enjoy his kisses whenever she pleased.

Enema (en'e-ma), any liquid or gaseous form of medicine for injection into the rectum. It is most commonly administered to induce peristaltic action of the bowels, but it is often the most desirable means of conveying into the system nourishment or stimulants.

Energy (en'er-ji), in physics, the power that a body or system possesses of doing work. A body may possess energy in one of two forms, viz., as *kinetic* energy, that is, the energy due to motion, and *potential* energy, that is, energy due to what may be called a position of advantage. Thus, a moving mass, a bullet for example, can do work in virtue of its motion, and the name kinetic energy is given to energy of this kind. Under this name is also included energy belonging to molecular motion, to electricity in motion, to heat and light, and to actual chemical action. Again, as examples of potential energy we may take the case of a mass raised up to a position in which it is capable of doing work by falling—the weight of a clock, for instance; but the term also includes the energy due to electrical separation, to absorbed heat, and to chemical separation, as in gunpowder, which is ready to do work by means of its explosion. From the investigations of Joule and others into the nature and phenomena of heat and the discovery of the equivalence of a definite quantity of mechanical energy to a definite quantity of heat, the grand principle of the *conservation of energy* was established. This asserts that the total amount of energy in the universe, or in any limited system which does not receive energy from without, or part with it to external matter, is invariable. If energy of any form seems to disappear in such a case it reappears in some other form. Thus, mechanical energy may be converted into heat. Heat again may be converted into the energy of electricity in motion, or into the potential energy of chemical separation. And electrical energy, whether potential or kinetic, and the energy of chemical separation, are also convertible into heat. (See also *Correlation of Physical Forces.*) Connected with this principle is another which states that no known natural process is *exactly* reversible, and that if we transform mechanical energy into heat, for example, we never can pass back and obtain from the heat produced precisely the amount of mechanical energy with which we commenced. Whatever attempt is made to transform and retransform energy by an imperfect process (and no known process is perfect), *part of the energy is necessarily transformed into heat*, and is *dissipated* so as to be incapable of further useful transformation. It, therefore, follows that as energy is in a constant state of transformation, there is a constant process of *degradation* of energy going on, a process by which energy constantly approaches the unavailable form of uniformly diffused heat and all the energy of the universe will take this final form, unless some process of reversal may arise.

Enfantin (aṅ-faṅ-taṅ), BARTHÉLEMY PROSPER, one of the chief apostles of St. Simonianism; born at Paris in 1796. In 1825 he became acquainted with St. Simon, who in dying confided to him the task of continuing

the work. This he did with success until after the revolution of 1830, when, as the representative of the social and religious theories of the school, he quarreled with Bazard, the representative of its political ideas. Enfantin organized model communities, which quickly fell to pieces; the new organ of the sect, the *Globe*, was a failure; their convent at Ménilmontant, of which Enfantin was 'supreme father,' was broken up by government (1832). He himself was imprisoned as an offender against public morality (being an advocate of free love), and on his release attempted to found a model colony in Egypt, which was broken up in the second year. He then retired to Tain (Drôme), where he lived for some time as a farmer. In 1841 he was sent as member of a commission to explore the industrial resources of Algiers, and on his return published a work on the *Colonization of Algiers* (1848). On the revolution of 1848 he started a new journal, the *Crédit Public*, but after two years withdrew from public notice. He afterwards held an official positon on the Lyons and Mediterranean Railway until his death in 1864.

Enfield (en'fēld), a market town of England, county of Middlesex, 9 miles north by east of London. It is the seat of the government manufactory of rifles and small arms. Pop. (1911) 56,344.

Enfield, a township of Hartford Co., Connecticut, 18 miles N. of Hartford; divided into three districts—Thompsonville, Hazardville, and Enfield Street. Carpets, rugs, automobile parts, casket hardware, paper, paint, and cloth, etc., are manufactured. Pop. 11,000.

Engadine (en-ga-dēn'), a beautiful valley in Switzerland, in the Grisons, on the bank of the Inn, bordering on the Tyrol, about 50 miles long, but in some parts very narrow, divided into Upper and Lower. The pop. of the whole valley amounts to about 12,000. The language generally spoken is the Ladin, a branch of the Romanic tongue. The cold, dry climate and mineral springs have made the valley a favorite resort for invalids.

Engaged Column, in architecture, a column attached to a wall so that part of it (usually less than half) is concealed.

Engel (eng'l), KARL, a German writer on music; born in 1818; died in 1882, at London, where he had been settled for more than thirty years. He wrote *The Music of the Most Ancient Nations, An Introduction to the Study of National Music, Musical Myths and Facts*, etc.

Enghien (âṅ-gi-âṅ), or ENGUIEN, a town in Hainault, Belgium, between Brussels and Tournai. It has a superb castle, and gave the title of duke to a prince of the house of Bourbon Condé in memory of the victory gained here by the great Condé. Pop. 4541.

Enghien (âṅ-gi-âṅ), LOUIS ANTOINE HENRI DE BOURBON, DUKE OF, born at Chantilly in 1772; son of Louis Henry Joseph Condé, Duke of Bourbon. On the outbreak of the revolution he quitted France, traveled through various parts of Europe, and went in 1792, to Flanders to join his grandfather, the Prince of Condé, in the campaign against France. From 1796 to 1799 he commanded with distinguished merit the vanguard of Condé's army, which was disbanded at the Peace of Lunéville (1801). He then took up residence as a private citizen at Ettenheim in Baden, where he married the Princess Charlotte de Rohan Rochefort. He was generally looked upon as the leader of the *émigrés*, and was suspected by the Bonapartists of complicity in the attempt of Cadoudal to assassinate the first consul. An armed force was sent to seize him in Baden in violation of all territorial rights, and he was brought to Vincennes on the 20th of March, 1804. A mock trial was held the same night; and on the following morning he was shot in the ditch outside the walls. It was this event which drew from Fouché the comment since become proverbial: 'C'est plus qu'un crime, c'est une faute' ('It is worse than a crime, it is a blunder').

Engine (en'jin), a mechanical contrivance in which one or other of the natural forces is utilized for the performance of work of some kind; often distinctively a steam engine.

Engineer (en-ji-nēr'), a term of somewhat loose application, being applied both to mechanics employed in the construction or management of steam engines, and also to persons in general 'who make the useful application of mechanical science their peculiar study and profession,' the term *engineering* having a corresponding meaning. Those who turn their attention especially to the construction of docks, bridges, canals, lighthouses, railroads, sewage and drainage, etc., are generally classed as *civil engineers;* those who devote themselves to the manufacture of machinery are known as *mechanical engineers;* while *mining engineers* are those who discover minerals and manage mines, and *electrical engineers* those who are con-

cerned in electrical applications. A distinct department from any of these is that of the *military engineer*. The special duties of the military engineer consist in the construction of fortifications, including the trenches and batteries required in besieging places; also of barracks and magazines, and of roads and bridges to facilitate the passage of an army. Civil engineering as a profession may be said to have originated in England about 1770, when the improvements of the steam engine by Watt opened a new field for invention and adaptive skill. Since then it has pursued an active course of development.

Engineers, CORPS OF, organized in the United States in 1802. It is a special arm of the military service, charged with the selection and purchase of sites and the construction of fortifications; the removal of obstructions in streams; and important field duties in preparing for the movement of forces. It also plans and superintends harbor and river improvements, and makes surveys and geographical explorations. Until 1866 the engineer corps had the superintendence of the West Point academy; but since that year all branches of the service share in its supervision. A similar corps in the British army is known as the Royal Engineers.

Engineers IN THE NAVY are commissioned officers having charge of the machinery of steam vessels. A thorough practical education in the construction and management of steam machinery is required. In military law they are considered non-combatants.

England, including WALES, the southern and larger portion of the island of Great Britain, is situated between 50° and 55° 46′ N. lat., and 1° 46′ E. and 5° 42′ W. lon. On the N. it is bounded by Scotland; on all other sides it is washed by the sea; on the E. by the North Sea or German Ocean; on the S. by the English Channel; and on the W. by St. George's Channel and the Irish Sea. Its figure is, roughly speaking, triangular, but with many windings and indentations, the coast-line measuring not less than 2765 miles. The length of the country, measured on a meridian from Berwick nearly to St. Alban's Head, is 365 miles. Its breadth, measured on a parallel of latitude, attains its maximum between St. David's Head, in South Wales, and the Naze, in Essex, where it amounts to 280 miles. The area is 58,311 square miles, of which 50,933 square miles are in England, and 7378 square miles in Wales. This is exclusive of the Channel Islands and the Isle of Man, which together would add 302 square miles more to the area. The subdivision of England into counties is said to date from the time when the country was still under several kings, but it does not appear to have assumed a definite form till the time of Alfred the Great. The existing division was first completed in the time of Henry VIII.

The capital of England and of the British Empire is London. The cities next in size (in order of population) are: Liverpool, Manchester, Birmingham, Sheffield, Leeds, Bristol. West Ham, Bradford, Kingston and Newcastle.

Physical Features.—The chief indentations are: on the east, the Humber, the Wash and the Thames estuary; on the west, the Solway Firth, Morecambe Bay, Cardigan Bay and the Bristol Channel; those on the south are less prominent, though including some useful harbors. The greater part of the coast consists of cliffs, in some places clayey, in others rocky, and sometimes jutting out into bold and precipitous headlands. The chief islands are: Holy Island, the Farne Islands, Sheppy and Thanet on the east coast; the Isle of Wight on the south; the Scilly Isles at the southwest extremity; and Lundy Island, Anglesey, Holyhead and Walney on the west.

The chief elevations of England and Wales are situated at no great distance from its western shores, and consist not so much of a continuous chain as of a succession of mountains and hills, stretching, with some interruptions, from north to south, and throwing out numerous branches on both sides. The most important of its offsets are those of the west, more especially if we include in them the mountain masses in Northwestern England sometimes classed separately as the Cumbrian range. Amid these mountains lie the celebrated English lakes, of which the most important are Windermere, Derwent Water, Coniston Lake and Ullswater. Here also is the highest summit of Northern England, Scawfell (3210 feet).

A large part of the surface of England consists of wide valleys and plains. Beginning in the north, the first valleys on the east side are those of the Coquet, Tyne and Tees; on the west the beautiful valley of the Eden, which, at first hemmed in between the Cumbrian range and Pennine chain, gradually widens out into a plain of about 470 square miles, with the town of Carlisle in its center. The most important of the northern plains is the Vale of York, which has an area of nearly 1000 square miles. Properly speaking, it is still the same

plain which stretches, with scarcely a single interruption, across the counties of Lincoln, Suffolk and Essex, to the mouth of the Thames, and to a considerable distance inland, comprising the Central Plain and the region of the Fens. On the west side of the island, in S. Lancashire and Cheshire, is the fertile Cheshire Plain. In Wales there are no extensive plains, the valleys generally having a narrow, rugged form favorable to romantic beauty, but not compatible with great fertility. Wales, however, by giving rise to the Severn, can justly claim part in the vale, or series of almost unrivaled vales, along which this stream pursues its romantic course through the counties of Montgomery, Salop, Worcester and Gloucester. Southeast of the Cotswold Hills is Salisbury Plain, but it is only in name that it can be classed with the other plains and level lands of England, being a large, elevated plateau, of an oval shape, with a thin, chalky soil only suitable for pasture. In the southwest the only vales deserving of notice are those of Taunton in Somerset and Exeter in Devon. A large portion of the southeast may be regarded as a continuous plain, consisting of what are called the Wealds of Sussex, Surrey and Kent, between the North and South Downs and containing an area of about 1000 square miles. The southeast angle of this district is occupied by the Romney Marsh, an extensive level tract composed, for the most part, of a rich marine deposit. Extensive tracts of a similar nature are situated on the east coast. Many of these lands are naturally the richest in the kingdom, but have been utilized only by means of drainage.

England is well supplied with rivers, some of them of great importance to industry and commerce. Most of them carry their waters to the North Sea. If we consider the drainage as a whole, four principal river basins may be distinguished, those of the Thames, Wash and Humber belonging to the German Ocean; and the Severn belonging to the Atlantic. The Thames, which is the chief of English rivers, has a length of 215 miles. Other rivers unconnected with these systems are the Tyne, Wear and Tees in the northeast; the Eden, Ribble, Mersey and Dee in the northwest. The south coast streams are very unimportant except for their estuaries.

In regard to the minerals, climate, agriculture, manufactures, etc., of England see the article *Britain*.

Civil History.—The history of England proper begins when it ceased to be a Roman possession. (See *Britain*.) On the withdrawal of the Roman forces, about the beginning of the fifth century A.D., the South Britons, or inhabitants of what is now called England, were no longer able to withstand the attacks of their ferocious northern neighbors, the Scots and Picts. They applied for assistance to Aëtius, but the Roman general was too much occupied in the struggle with Attila to attend to their petition. In their distress they appear to have sought the aid of the Saxons; and according to the Anglo-Saxon narratives, three ships, containing 1600 men, were despatched to their help under the command of the brothers Hengest and Horsa. Vortigern, a duke or prince of the Britons, assigned them the isle of Thanet for habitation, and marching against the northern foe, they obtained a complete victory. The date assigned to these events by the later Anglo-Saxon chronicles is 449 A.D., the narratives asserting further that the Saxons, finding the land desirable, turned their arms against the Britons, and, reinforced by new bands, conquered first Kent and ultimately the larger part of the island. Whatever the credibility of the story of Vortigern, it is certain that in the middle of the fifth century the occasional Teutonic incursions gave place to persistent invasion with a view to settlement. These Teutonic invaders were Low German tribes from the country about the mouths of the Elbe and the Weser, the three most prominent being the Angles, the Saxons and the Jutes. Of these the Jutes were the first to form a settlement, taking possession of part of Kent, the Isle of Wight, etc.; but the larger conquests of the Saxons in the south and the Angles in the north gave to these tribes the leading place in the kingdom. The struggle continued for 150 years, and at the end of that period the whole southern part of Britain, with the exception of Strathclyde, Wales and West Wales (Cornwall), was in the hands of the Teutonic tribes. This conquered territory was divided among a number of small states or petty chieftaincies, seven of the most conspicuous of which are often spoken of as the *Heptarchy*. These were: 1. The kingdom of Kent; founded by Hengest in 455; ended in 823. 2. Kingdom of South Saxons, founded by Ella in 477; ended in 689. 3. Kingdom of East Angles, founded by Uffa in 571 or 575; ended in 792. 4. Kingdom of West Saxons; founded by Cerdic in 519; swallowed up the rest in 827. 5. Kingdom of Northumbria, founded by Ida in 547; absorbed by Wessex in 827.

6. Kingdom of East Saxons, founded by Erchew in 527; ended in 823. 7. Kingdom of Mercia, founded by Cridda about 584; absorbed by Wessex in 827. Each state was, in its turn, annexed to more powerful neighbors; and at length, in 827, Egbert, king of the West Saxon kingdom (Wessex), by his valor and superior capacity, united in his own person the sovereignty of what had formerly been seven kingdoms, and the whole came to be called England, that is Angle-land.

While this work of conquest and of intertribal strife had been in progress towards the establishment of a united kingdom, certain important changes had occurred. The conquest had been the slow expulsion of a Christian race by a purely heathen race, and the country had returned to something of its old isolation with regard to the rest of Europe. But before the close of the sixth century Christianity had secured a footing in the southeast of the island. Ethelbert, king of Kent and suzerain over the kingdoms south of the Humber, married a Christian wife, Bertha, daughter of Charibert of Soissons, and this event indirectly led to the coming of St. Augustine. The conversion of Kent, Essex and East Anglia was followed by that of Northumberland and then by that of Mercia, of Wessex, of Sussex, and lastly of Wight, the contest between the two religions being at its height in the seventh century. The legal and political changes immediately consequent upon the adoption of Christianity were not great, but there resulted a more intimate relation with Europe and the older civilizations, the introduction of new learning and culture, the formation of a written literature, and the fusion of the tribes and petty kingdoms into a closer and more lasting unity than that which could have been otherwise secured.

The kingdom, however, was still kept in a state of disturbance by the attacks of the Danes, who had made repeated incursions during the whole of the Saxon period, and about half a century after the unification of the kingdom became, for a brief time, masters of nearly the whole of England. But the genius of Alfred the Great, who had ascended the throne in 871, speedily reversed matters by the defeat of the Danes at Ethandune (878). Guthrum, their king, embraced Christianity, became the vassel of the Saxon king, and retired to a strip of land on the east coast, including Northumbria and called the Danelagh. The two immediate successors of Alfred, Edward (901-925) and Athelstan (925-940), the son and the grandson of Alfred, both vigorous and able rulers, had each in turn to direct his arms against these settlers of the Danelagh. The reigns of the next five kings, Edmund, Edred, Edwy, Edgar and Edward the Martyr, are chiefly remarkable on account of the conspicuous place occupied in them by Dunstan, who was counselor to Edmund, minister of Edred, treasurer under Edwy, and supreme during the reigns of Edgar and his successor. It was possibly due to his policy that from the time of Athelstan till after the death of Edward the Martyr (978 or 979) the country had comparative rest from the Danes. During the tenth century many changes had taken place in the Teutonic constitutions. Feudalism was already taking root; the king's authority had increased; the folkland was being taken over as the king's personal property; the nobles by birth, or ealdormen, were becoming of less importance in administration than the nobility of thegns, the officers of the king's court. Ethelred (978-1016), who succeeded Edward, was a minor, the government was feebly conducted, and no united action being taken against the Danes their incursions became more frequent and destructive. Animosities between the English and the Danes who had settled among them became daily more violent, and a general massacre of the latter took place in 1002. The following year Sweyn invaded the kingdom with a powerful army and assumed the crown of England. Ethelred was compelled to take refuge in Normandy; and though he afterwards returned, he found in Canute an adversary no less formidable than Sweyn. Ethelred left his kingdom in 1016 to his son Edmund, who displayed great valor, but was compelled to divide his kingdom with Canute; and when he was assassinated in 1017 the Danes succeeded to the sovereignty of the whole.

Canute (Knut) who espoused the widow of Ethelred, that he might reconcile his new subjects, obtained the name of Great, not only on account of his personal qualities, but from the extent of his dominions, being master of Denmark and Norway as well as England. In 1035 he died, and in England was followed by other two Danish kings, Harold and Hardicanute, whose joint reigns lasted till 1042, after which the English line was again restored in the person of Edward the Confessor. Edward was a weak prince, and in the latter years of his reign had far less real power than his brother-in-law Harold, son of the great earl Godwin. On

Edward's death in 1066 Harold accordingly obtained the crown. He found, however, a formidable opponent in the second cousin of Edward, William of Normandy, who instigated the Danes to invade the northern counties, while he, with 60,000 men, landed in the south. Harold vanquished the Danes, and hastening southward met the Normans near Hastings, at Senlac, afterwards called Battle. Harold and his two brothers fell (October 14, 1066), and William (1066-87) immediately claimed the government as lawful king of England, being subsequently known as William I, the Conqueror. For some time he conducted the government with great moderation; but being obliged to reward those who had assisted him he bestowed the chief offices of government upon Normans, and divided among them a great part of the country. The revolts of the native English which followed were quickly crushed, continental feudalism in a modified form was established, and the English Church reorganized under Lanfranc as Archbishop of Canterbury.

At his death, in 1087, William II, commonly known by the name of Rufus, the conqueror's second son, obtained the crown, Robert, the eldest son, receiving the duchy of Normandy. In 1100, when William II was accidentally killed in the New Forest, Robert was again kept from the throne by his younger brother Henry (Henry I), who in 1106 even wrested from him the duchy of Normandy. Henry's power being secured, he entered into a dispute with Anselm the primate, and with the pope concerning the right of granting investure to the clergy. He supported his quarrel with firmness, and brought it to a favorable issue. His reign was also marked by the suppression of the greater Norman nobles in England, whose power (like that of many continental feudatories) threatened to overshadow that of the king, and by the substitution of a class of lesser nobles. In 1135 he died in Normandy, leaving behind him only a daughter, Matilda.

By the will of Henry I his daughter Maud or Matilda, wife of Geoffrey Plantagenet, Count of Anjou, and frequently styled the Empress Matilda, because she had first been married to Henry V, emperor of Germany, was declared his successor. But Stephen, son of the Count of Blois, and of Adela, daughter of William the Conqueror, raised an army in Normandy, landed in England, and declared himself king. After years of civil war and bloodshed an amicable arrangement was brought about, by which it was agreed that Stephen should continue to reign during the remainder of his life, but that he should be succeeded by Henry, son of Matilda and the Count of Anjou. Stephen died in 1154, and Henry Plantagenet ascended the throne with the title of Henry II, being the first of the Plantagenet or Angevin kings. A larger dominion was united under his sway than had been held by any previous sovereign of England, for at the time when he became king of England he was already in the possession of Anjou, Normandy and Aquitaine.

Henry II found far less difficultv in restraining the license of his barons than in abridging the exorbitant privileges of the clergy, who claimed exemption not only from the taxes of the state, but also from its penal enactments, and who were supported in their demands by the primate Becket. The king's wishes were formulated in the Constitutions of Clarendon (1164), which were at first accepted and then repudiated by the primate. The assassination of Becket, however, placed the king at a disadvantage in the struggle, and after his conquest of Ireland (1171) he submitted to the church, and did penance at Becket's tomb. Henry was the first who placed the common people of England in a situation which led to their having a share in the government. The system of frank-pledge was revived, trial by jury was instituted by the Assize of Clarendon, and the Eyre courts were made permanent by the Assize of Nottingham. To curb the power of the nobles he granted charters to town, freeing them from all subjection to any but himself, thus laying the foundation of a new order in society.

Richard I, called Cœur de Lion, who in 1189 succeeded to his father, Henry II, spent most of his reign away from England. Having gone to Palestine to join in the third crusade, he proved an intrepid soldier. Returning homeward in disguise through Germany, he was made prisoner by Leopold, duke of Austria, but was ransomed by his subjects. In the meantime John, his brother, had aspired to the crown, and hoped, by the assistance of the French, to exclude Richard from his right. Richard's presence for a time restored matters to some appearance of order; but having undertaken an expedition against France, he received a mortal wound at the siege of Chalons, in 1199.

John was at once recognized as King of England, and secured possession of Normandy; but Anjou, Maine and Tou-

raine acknowledged the claim of Arthur, son of Geoffrey, second son of Henry II. On the death of Arthur, while in John's power, these four French provinces were at once lost to England. John's opposition to the pope in electing a successor to the see of Canterbury in 1205 led to the kingdom being placed under an interdict; and the nation being in a disturbed condition, he was at last compelled to receive Stephen Langton as archbishop, and to accept his kingdom as a fief of the papacy (1213). His exactions and misgovernment had equally embroiled him with the nobles. In 1213 they refused to follow him to France, and on his return defeated, they at once took measures to secure their own privileges and abridge the prerogatives of the crown. King and barons met at Runnymede, and on June 15, 1215, the Great Charter (Magna Charta) was signed. It was speedily declared null and void by the pope, and war broke out between John and the barons, who were aided by the French king. In 1216, however, John died, and his turbulent reign was succeeded by the almost equally turbulent reign of Henry III.

During the first years of the reign of Henry III, the abilities of the Earl of Pembroke, who was regent until 1219, retained the kingdom in tranquillity; but when, in 1227, Henry assumed the reins of government he showed himself incapable of managing them. The charter was three times reissued in a modified form, and new privileges were added to it, but the king took no pains to observe its provisions. The struggle, long maintained in the great council (henceforward called Parliament) over money grants and other grievances reached an acute stage in 1263, when civil war broke out. Simon de Montfort, who had laid the foundations of the House of Commons by summoning representatives of the shire communities to the Mad Parliament of 1258, had by this time engrossed the sole power. He defeated the king and his son Edward at Lewes in 1264, and in his famous parliament of 1265 still further widened the privileges of the people by summoning to it burgesses as well as knights of the shire. The escape of Prince Edward, however, was followed by the battle of Evesham (1265), at which Earl Simon was defeated and slain, and the rest of the reign was undisturbed.

On the death of Henry III, in 1272, Edward I succeeded without opposition. From 1276 to 1284 he was largely occupied in the conquest and annexation of Wales, which had become practically independent during the barons' wars. In 1292 Balliol, whom Edward had decided to be rightful heir to the Scottish throne, did homage for the fief to the English king; but when, in 1294, war broke out with France, Scotland also declared war. The Scots were defeated at Dunbar (1296), and the country placed under an English regent; but the revolt under Wallace (1297) was followed by that of Bruce (1306), and the Scots remained unsubdued. The reign of Edward was distinguished by many legal and legislative reforms, such as the separation of the old king's court into the Court of Exchequer, Court of King's Bench, and Court of Common Pleas, the passage of the Statute of Mortmain, etc. In 1295 the first perfect parliament was summoned, the clergy and barons by special writ, the commons by writ to the sheriffs directing the election of two knights from each shire, two citizens from each city, two burghers from each borough. Two years later the imposition of taxation without consent of parliament was forbidden by a special act (De Tallagio non Concedendo). The great aim of Edward, however, to include England, Scotland and Wales in one kingdom proved a failure, and he died in 1307 marching against Robert Bruce.

The reign of his son Edward II was unfortunate to himself and to his kingdom. He made a feeble attempt to carry out his father's last and earnest request to prosecute the war with Scotland, but the English were almost constantly unfortunate; and at length, at Bannockburn (1314), they received a defeat from Robert Bruce which ensured the independence of Scotland. The king soon proved incapable of regulating the lawless conduct of his barons; and his wife, a woman of bold, intriguing disposition, joined in the confederacy against him, which resulted in his imprisonment and death in 1327.

The reign of Edward III was as brilliant as that of his father had been the reverse. The main projects of the third Edward were directed against France, the crown of which he claimed in 1328 in virtue of his mother, the daughter of King Philip. The victory won by the Black Prince at Crécy (1346), the capture of Calais (1347), and the victory of Poitiers (1356) ultimately led to the Peace of Brétigny, in 1360, by which Edward III received all the west of France on condition of renouncing his claim to the French throne. (See *Brétigny*.) Before the close of his reign however, these advantages were all lost

again, save a few principal towns on the coast.

Edward III was succeeded in 1377 by his grandson Richard II, son of Edward the Black Prince. The people of England now began to show, though in a turbulent manner, that they had acquired just notions of government. In 1380 an unjust and oppressive poll tax brought their grievances to a head, and 100,000 men, under Wat Tyler, marched towards London (1381). Wat Tyler was killed while conferring with the king, and the prudence and courage of Richard appeased the insurgents. Despite his conduct on this occasion, Richard was deficient in the vigor necessary to curb the lawlessness of the nobles. In 1398 he banished his cousin, Henry Bolingbroke; and on the death of the latter's father, the duke of Lancaster, unjustly appropriated his cousin's patrimony. To avenge the injustice Bolingbroke landed in England during the king's absence in Ireland, and at the head of 60,000 malcontents compelled Richard to surrender. He was confined in the Tower, and despite the superior claims of Edmund Mortimer, Earl of March, Henry was appointed king (1399), the first of the House of Lancaster. Richard was, in all probability, murdered early in 1400.

The manner in which the Duke of Lancaster, now Henry IV, acquired the crown rendered his reign extremely turbulent, but the vigor of his administration quelled every insurrection. The most important—that of the Percies of Northumberland, Owen Glendower and Douglas of Scotland—was crushed by the battle of Shrewsbury (1403). During the reign of Henry IV the clergy of England first began the practice of burning heretics under the act *de hæretico comburendo*, passed in the second year of his reign. The act was chiefly directed against the Lollards, as the followers of Wickliffe now came to be called. Henry died in 1413, leaving his crown to his son, Henry V, who revived the claim of Edward III to the throne of France in 1415 and invaded that country at the head of 30,000 men. The disjointed councils of the French rendered their country an easy prey; the victory of Agincourt was gained in 1415; and after a second campaign a peace was concluded at Troyes in 1420, by which Henry received the hand of Katherine, daughter of Charles VI, was appointed regent of France during the reign of his father-in-law, and declared heir to the throne on his death. The two kings, however, died within a few weeks of each other in 1422, and the infant son of Henry thus became King of England (as Henry VI) and France at the age of nine months.

England during the reign of Henry VI was subjected, in the first place, to all the confusion incident to a long minority, and afterwards to all the misery of a civil war. Henry allowed himself to be managed by any one who had the courage to assume the conduct of his affairs, and the influence of his wife, Margaret of Anjou, a woman of uncommon capacity, was of no advantage either to himself or the realm. In France (1422-53) the English forces lost ground, and were finally expelled by the celebrated Joan of Arc, Calais alone being retained. The rebellion of Jack Cade in 1450 was suppressed, only to be succeeded by more serious trouble. In that year Richard, Duke of York, the father of Edward, afterwards Edward IV, began to advance his pretensions to the throne, which had been so long held by the house of Lancaster. His claim was founded on his descent from the third son of Edward III, Lionel, duke of Clarence, who was his great-great-grandfather on the mother's side, while Henry was the great-grandson on the father's side of John of Gaunt, duke of Lancaster, the fourth son of Edward III. Richard of York was also grandson on the father's side of Edmund, fifth son of Edward III. The wars which resulted, called the Wars of the Roses, from the fact that a red rose was the badge of the house of Lancaster and a white one that of the house of York, lasted for thirty years, from the first battle of St. Albans, May 22, 1455, to the battle of Bosworth, August 22, 1485. Henry VI was twice driven from the throne (in 1461 and 1471) by Edward of York, whose father had previously been killed in battle in 1460. Edward of York reigned as Edward IV from 1461 till his death in 1483, with a brief interval in 1471; and was succeeded by two other sovereigns of the house of York, first his son, Edward V, who reigned for eleven weeks in 1483; and then by his brother, Richard III. who reigned from 1483 till 1485, when he was defeated and slain on Bosworth field by Henry Tudor, of the house of Lancaster, who then became Henry VII.

Henry VII was at this time the representative of the house of Lancaster, and in order at once to strengthen his own title, and to put an end to the rivalry between the houses of York and Lancaster, he married in 1486 Elizabeth, the sister of Edward V and heiress of the house of York. His reign was disturbed by insurrections attending the impostures of Lambert Simnel (1487), who

pretended to be a son of the Duke of Clarence, brother of Edward IV, and of Perkin Warbeck (1488), who affirmed that he was the duke of York, younger brother of Edward V; but neither of these attained any magnitude. The king's worst fault was the avarice which led him to employ in schemes of extortion such instruments as Empson and Dudley. His administration throughout did much to increase the royal power and to establish order and prosperity. He died in 1509.

The authority of the English crown, which had been so much extended by Henry VII, was by his son, Henry VIII, exerted in a tyrannical and capricious manner. The most important event of the reign was undoubtedly the Reformation; though it had its origin rather in Henry's caprice and in the casual situation of his private affairs than in his conviction of the necessity of a reformation in religion, or in the solidity of reasoning employed by the reformers. Henry had been espoused to Catharine of Spain, who was first married to his elder brother Arthur, a prince who died young. Henry became dissatisfied with his queen, and enamored of one of her maids of honor, Anne Boleyn. He had recourse, therefore, to the pope to dissolve a marriage which had at first been rendered legal only by a dispensation from the pontiff; but failing in his desires he broke away entirely from the Holy See, and in 1534 got himself recognized by act of parliament as the head of the English Church. He died in 1547. He was married six times, and left three children, each of whom reigned in turn. These were: Mary, by his first wife, Catharine of Aragon; Elizabeth, by his second wife, Anne Boleyn; and Edward, by his third wife, Jane Seymour.

Edward, who reigned first, with the title of Edward VI, was nine years of age at the time of his succession, and died in 1553, when he was only sixteen. His short reign, or rather the reign of the Earl of Hertford, afterwards Duke of Somerset, who was appointed regent, was distinguished chiefly by the success which attended the measures of the reformers, who acquired great part of the power formerly engrossed by the Catholics. The intrigues of Dudley, duke of Northumberland, during the reign of Edward, caused Lady Jane Grey to be declared his successor: but her reign, if it could be called such, lasted only a few days. Mary, daughter of Henry VIII, was placed upon the throne, and Lady Jane Grey and her husband were both executed. Mary, a bigoted Catholic, seems to have wished for the crown only for the purpose of reëstablishing the Roman Catholic faith. Political motives had induced Philip of Spain to accept of her as a spouse; but she could never prevail on her subjects to allow him any share of power. She died in 1558.

Elizabeth, who succeeded her sister Mary, was attached to the Protestant faith, and found little difficulty in establishing it in England. Having concluded peace with France (1559), Elizabeth set herself to promote the confusion which prevailed in Scotland, to which her cousin Mary had returned from France as queen in 1561. In this she was so far successful that Mary placed herself in her power (1568), and after many years' imprisonment was sent to the scaffold (1587). As the most powerful Protestant nation, and as a rival to Spain in the New World, it was natural that England should become involved in difficulties with that country. The dispersion of the Armada by the English fleet under Howard, Drake and Hawkins was the most brilliant event of a struggle which abounded in minor feats of valor. In Elizabeth's reign London became the center of the world's trade, the extension of British commercial enterprise being coincident with the ruin of Antwerp in 1585. The parliament was increased by the creation of sixty-two new boroughs, and its members were exempted from arrest. In literature not less than in politics and in commerce the same full life displayed itself, and England began definitely to assume the characteristics which distinguish her from the other European nations of to-day.

To Elizabeth succeeded (in 1603) James VI of Scotland and I of England, son of Mary, Queen of Scots, and Darnley. His accession to the crown of England in addition to that of Scotland did much to unite the two nations, though a certain smoldering animosity still lingered. His dissimulation, however, ended in his satisfying neither of the contending ecclesiastical parties—the Puritans or the Catholics; and his absurd insistence on his divine right made his reign a continuous struggle between the prerogative of the crown and the freedom of the people. His extravagance kept him in constant disputes with the parliament, which would not grant him the sums he demanded, and compelled him to resort to monopolies, loans, benevolences, and other illegal methods. The nation at large, however, continued to prosper through the whole of this inglorious reign. His son, Charles

I, who succeeded him in 1625, inherited the same exalted ideas of royal prerogative, and his marriage with a Catholic, his arbitrary rule and illegal methods of raising money provoked bitter hostility. Under the guidance of Laud and Strafford things went from bad to worse. Civil war broke out in 1642 between the king's party and that of the parliament, and the latter proving victorious, in 1649 the king was beheaded.

A commonwealth or republican government was now established, its most prominent figure being Oliver Cromwell, the ablest leader of the parliamentary forces. Mutinies in the army among Fifth-monarchists and Levellers were subdued by Cromwell and Fairfax, and Cromwell in a series of masterly movements subjugated Ireland and gained the important battles of Dunbar and Worcester. At sea Blake had destroyed the Royalist fleet under Rupert, and was engaged in an honorable struggle with the Dutch under Van Tromp. But within the governing body matters had come to a deadlock. A dissolution was necessary, yet parliament shrank from dissolving itself, and in the meantime the reform of the law, a settlement with regard to the church, and other important matters remained untouched. In April, 1653, Cromwell cut the knot by forcibly ejecting the members and putting the keys of the house in his pocket. From this time he was practically head of the government, which was vested in a council of thirteen. A parliament—the Little or Barebone's Parliament—was summoned, and in December of the same year Cromwell was installed Lord Protector of the Commonwealth of England, Scotland and Ireland. With more than the power of a king, he succeeded in dominating the confusion at home and made the country feared throughout the whole of Europe. Cromwell died in 1658, and the brief and feeble protectorate of his son Richard followed.

There was now a widespread feeling that the country would be better under the old form of government, and Charles II, son of Charles I, was called to the throne by the restoration of 1660. He took complete advantage of the popular reaction from the narrowness and intolerance of Puritanism and in his later years endeavored to carry it to the extreme of establishing the Catholic religion. The promises of religious freedom made by him before the restoration in the Declaration of Breda were broken by the Test and Corporation acts, and by the Act of Uniformity, which drove two thousand clerygmen from the church and created the great dissenting movement of modern times. The Conventicle and Five-mile Acts followed, and the 'Drunken Parliament' restored Episcopacy in Scotland. At one time even civil war seemed again imminent. The abolition of the censorship of the press (1679) and the reaffirmation of the Habeas Corpus principle are the most praiseworthy incidents of the reign.

As Charles II left no legitimate issue, his brother, the duke of York, succeeded him as James II (1685-88). An invasion by an illegitimate son of Charles, the duke of Monmouth, who claimed the throne, was suppressed, and the king's arbitrary rule was supported by the wholesale butcheries of such instruments as Kirke and Jeffreys. The king's zealous countenance of Roman Catholicism and his attempts to force the church and the universities to submission provoked a storm of opposition. Seven prelates were brought to trial for seditious libel, but were acquitted amid general rejoicing. The whole nation was prepared to welcome any deliverance, and in 1688 William of Orange, husband of James' daughter Mary, landed in Torbay. James fled to France, and a convention summoned by William settled the crown upon him, he thus becoming William III. Annexed to this settlement was a Declaration of Rights circumscribing the royal prerogative by depriving the king of the right to exercise dispensing power, or to exact money, or maintain an army without the assent of parliament. This placed henceforward the right of the British sovereign to the throne upon a purely statutory basis. A toleration act, passed in 1689, released dissent from many penalties. An armed opposition to William lasted for a short time in Scotland, but ceased with the fall of Viscount Dundee, the leader of James' adherents; and though the struggle was prolonged in Ireland, it was brought to a close before the end of 1691. The following year saw the origination of the national debt, the exchequer having been drained by the heavy military expenditure. A bill for triennial parliaments was passed in 1694, the year in which Queen Mary died. For a moment after her death William's popularity was in danger, but his successes at Namur and elsewhere, and the obvious exhaustion of France, once more confirmed his power. The treaty of Ryswick followed in 1697, and the death of James II in exile, in 1701, removed an important source of danger. Early in the following year William also died,

and by the act of settlement Anne succeeded him.

The closing act of William's reign had been the formation of the grand alliance between England, Holland and the German Empire, and the new queen's rule opened with the brilliant successes of Marlborough at Blenheim (1704) and Ramilies (1706). Throughout the earlier part of her reign the Marlboroughs practically ruled the kingdom, the duke's wife, Sarah Jennings, being the queen's most intimate friend and adviser. In 1707 the history of England becomes the history of Britain, the Act of Union passed in that year binding the parliaments and realms of England and Scotland into a single and more powerful whole. For the later history of England see article *Britain*.

Ecclesiastical History.—The first religion of the Celts of England was Druidism. It has been conjectured that Christianity may have reached Britain by way of France (Gaul) before the conclusion of the first, or not long after the commencement of the second century, but the period and manner of its introduction are uncertain. It had, however, made considerable progress in the island previous to the time of Constantine the Great (306-337).

A period of almost total eclipse followed the inroad of the pagan Saxons, and it was not till A.D. 570 that signs of change showed themselves in the new nationality. On the coming of Austin, or St. Augustine, sent over in 596 by Gregory the Great, a residence at Canterbury was assigned to him, and Ethelbert, king of Kent, and most of his subjects, adopted Christianity. Other missionaries followed; East Saxons were soon after converted by Mellitus; and a bishop's see was established at London, their capital, early in the seventh century. The Northumbrians were next converted, and the conversion of the other kingdoms followed in the course of the seventh century.

To promote the union of the churches thus founded in England with the Church of Rome, a grand council was summoned by Theodore of Tarsus, archbishop of Canterbury, at Hertford, in A.D. 673, when uniformity was secured among all the English churches, and the see of Canterbury made supreme.

The clergy in course of time attained, particularly after the Norman conquest, to such a height of domination as to form an *imperium in imperio*. Under Anselm (1093-1109) the church was practically emancipated from the control of the state, and the power of the pope became supreme. The result was a considerable increase of monasticism in England, and the prevalence of the greatest abuses under the cloak of church privilege. Several monarchs showed themselves restive under the papal control, but without shaking off the yoke; and though Henry II succeeded in abating some evils, yet the severity of the penance exacted from him for the murder of Becket is a striking proof of the power that the church then had in punishing offenses committed against itself. The reaction set in during the reign of Henry III, when the vigorous independence of Robert Grosseteste did much to stimulate the individual life of the English church. With the reign of Edward I the new system of parliaments came as an effective rival of the church synods, and various acts restrained the power of the clergy. In the fourteenth century the teaching of Wickliffe promised to produce a thorough revolt from Rome; but the difficulties of the house of Lancaster, which drove its members to propitiate the church, and the Wars of the Roses, prevented matters coming to a head.

A steady decay of vital power set in, however, and when Henry VIII resolved to recast the English church there was no effective protest. In 1531 the convocation of the clergy addressed a petition to Henry VIII, as the chief protector and only and supreme lord of the English Church. Not very long after the parliament abolished appeals to the see of Rome, dispensations, licenses, bull of institution for bishoprics and archbishoprics, the payment of Peter's-pence, and the annates. In 1534 the papal authority was set aside by act of parliament, and by another act of parliament, passed in 1535, Henry assumed the title of protector of the Church of England. These acts, although they severed the connection between the English Church and the holy see, did not alter the religious faith of the church. But under Edward VI, the Duke of Somerset, the protector of the realm during the minority of the king, caused a more thorough reform of the doctrines and ceremonies of the church to be made. At his instigation parliament in 1547 repealed the statute of the six articles promulgated by Henry VIII, and in 1551 a new confession of faith was embodied in forty-two articles, denying the infallibility of councils, keeping only two sacraments, baptism and the Lord's supper, and rejecting the real presence, the invocation of saints, prayer for the dead, purgatory, and the celibacy of the clergy. At the same time a new liturgy

was composed, in which English was substituted for Latin.

With the reign of Mary the old religion was reëstablished: and it was not till that of Elizabeth that the Church of England was finally instituted in its present form. The doctrines of the church were again modified, and the forty-two articles were reduced to thirty-nine by the convocation of the clergy in 1563. In 1559, before the close of the first year of Elizabeth's reign, the Acts of Supremacy and Uniformity were passed with the object of bringing about the entire subjection of the church and the people in religious matters to the royal authority.

From James I some relief was anticipated by Puritans and nonconformists, but they were disappointed. Under Charles I the attempt was made, through the instrumentality of Laud, to reduce all the churches of Great Britain under the jurisdiction of bishops. But after the death of Laud the parliament abolished the episcopal government, and condemned everything contrary to the doctrine, worship and discipline of the Church of Geneva. As soon as Charles II was restored the ancient forms of ecclesiastical government and public worship were reëstablished and three severe measures were passed against nonconformity, namely, the Corporation Act of 1661, the Act of Uniformity, passed in 1662, and the Test Act, passed in 1673. In the reign of William III, and particularly in 1689, the divisions among the friends of episcopacy gave rise to the two parties called the *high-churchmen* or *non-jurors* and *low-churchmen*. The former maintained the doctrine of passive obedience to the sovereign; that the hereditary succession to the throne is of divine institution; that the church is subject to the jurisdiction of God alone, etc. The gradual progress of civil and religious liberty since that time has settled practically many such controversies. The great increase of the Dissenters in recent times (they are not much less numerous than the members of the Established Church) has led to new concessions in their favor, and especially to the repeal of the Corporation and Test acts (in 1828), the Catholic emancipation (in 1829), and the opening of the universities in England to Dissenters (1871). As at present constituted, the established religion of England is Episcopacy. The sovereign is the supreme head. The church is governed by two archbishops and thirty-one bishops. The Archbishop of Canterbury is styled the *primate of all England*, and to him belongs the privilege of crowning the kings and queens of England. The Archbishop of York is styled *primate of England*. The doctrine of the Church of England are contained in the Thirty-nine Articles; the form of worship is contained in the Book of Common Prayer.

Englewood, a city of Bergen County, New Jersey, 14 miles N. of New York.

English Architecture, Early.

See *Early English Architecture.*

English Art.

As regards *architecture*, little can be said in respect to the style prevalent in England between the invasion of the Anglo-Saxons and the Norman Conquest, from the fact that the remains of buildings erected in England before the Conquest are few and insignificant. The Norman style was introduced in the reign of Edward the Confessor, though the workmen, both then and after the Conquest, being English, the earlier work preserved many native characteristics. The Norman period proper extends from about 1090 to 1150, some of the best examples being parts of the cathedrals of Rochester, Winchester, Durham and Canterbury. In the brief period 1160 to 1195 a marked change took place in the adoption of the pointed arch and what is known as *the Early English style*. Improved methods of construction led to the use of lighter walls and pillars instead of the heavy masses employed in the Norman style. Narrow, lancet-shaped windows took the place of the round arch; bold projecting buttresses were introduced; and the roofs and spires became more lofty and more pointed, while in the interiors pointed arches rested on lofty, clustered pillars. The best Early English type is Salisbury Cathedral. The Early English style has been regarded as lasting from 1190 to 1270, when the *Decorated style* of Gothic began to prevail. The transition to the Decorated style was gradual, but it may be considered as lasting to 1377. Exeter Cathedral is an excellent example of the earliest Decorated style. Between 1360 and 1399 the Decorated style gave place to *the Perpendicular*, which prevailed from 1377 to 1547, and was an exclusively English style. Gothic architecture, though it lingered on in many districts, practically came to an end in England in the reign of Henry VIII. The *Elizabethan and Jacobean styles* which followed were transitions from the Gothic to the Italian, with which these styles were more or less freely mixed. Many palatial mansions were built in

these styles. In the reign of Charles I Inigo Jones designed, among other buildings, Whitehall Palace and Greenwich Hospital in a purely classic style. After the great fire in London (1666) Sir Christopher Wren designed an immense number of churches and other buildings in classic style, particularly St. Paul's Cathedral, the Sheldonian Theater of Oxford, Chelsea Hospital, etc. Various phases of classic or Renaissance continued to prevail during the eighteenth and earlier part of the nineteenth century. About 1836 the Gothic revival commenced, and that style has been employed with considerable success in the churches erected in recent times. The Houses of Parliament, erected in 1840-60 in the Tudor style, the Law Courts of Salford, St. Pancras railway station, and the Law Courts of London (opened 1882) in the Gothic, served to sustain an impetus that had been given to the use of that style. At the present day Gothic is much employed for ecclesiastical and collegiate buildings, and a mild type of Renaissance for civil buildings. Of late years a style that has received the name of 'Queen Anne' is much in vogue for private residences. It is very mixed, but withal highly picturesque.

Very little is known of the state of the art of *painting* among the Anglo-Saxons; but in the ninth century Alfred the Great caused numerous MSS. to be adorned with miniatures, and about the end of the tenth century Archbishop Dunstan won reputation as a miniature painter. Under William the Conquerer and his two sons the painting of large pictures began to be studied, and Lanfranc, archbishop of Canterbury, adorned the vault of his church with paintings. Numerous miniatures of the thirteenth and fourteenth centuries have come down to us, rude in execution, but not without originality. From this period down to the eighteenth century a succession of foreign painters resided in England, of whom the chief were Mabuse, Hans Holbein, Federigo Zucchero, Cornelius Jansen, Vandyck, Lely and Kneller. Of native artists few are of importance prior to William Hogarth (1697-1764). Throughout the eighteenth century English artists attained higher eminence in portrait painting than in other departments, and it culminated in Sir Joshua Reynolds, Thomas Gainsborough and George Romney. Barry, West and Copley gained distinction in historical compositions, especially in pictures of battles. Landscape painting was represented by Richard Wilson, who painted classical scenes with figures from heathen mythology, and by Gainsborough, already mentioned, who painted scenes of English nature and humble life. The Royal Academy of Arts, of which Reynolds was the first president, was established in London in 1769. Sir David Wilkie (1785-1841), in what is known abroad as *genre* painting, gained a European reputation that is unsurpassed. In landscape the reputation of Turner (1775-1857) 'stands alone, solitary, colossal' (Wornum). There were other distinguished landscape painters, among them Roberts, Müller and Constable, whose works exercised great influence in France. John Philip greatly distinguished himself by his scenes from Spanish life and by his mastery in color. Landseer stands by himself as a painter of animals. In affecting a more accurate and careful style of work, the Pre-Raphaelites (1840-60), while seeking to restore in their practice an early phase of Italian art, exercised a beneficial influence, while they themselves ultimately abandoned the style to which at the first they had been devoted. The list of more recent painters, some of them of high artistic powers, is too extended to be here given.

English *sculpture* was long merely an accessory to architecture, and few English sculptors are known by name till comparatively modern times. During the Renaissance period Torregiano came from Italy and executed two masterpieces in England, the tomb of the mother of Henry VII, and that of Henry himself at Westminster. The troubles of the reign of Charles I and the Commonwealth produced a stagnation in the art, and were the cause of the destruction of many valuable works. After the Restoration two sculptors of some note appeared, Grinling Gibbons, a wood-carver, and Caius Gabriel Cibber. In the eighteenth century John Flaxman imitated the classic sculpture, and Sir Francis Chantrey produced works in a pseudo-classic style. A return to nature was attempted by Westmacott, Wyatt and Bell; but the first effectual rebellion against the classic dates from Alfred Stevens (1817-75). Other sculptors of note are Sir Edward Landseer (1802-73), who executed the lions on Nelson's monument; Lord Leighton (1830-96), whose 'Athlete Struggling with the Python' and 'Sluggard' are well known; Alfred Gilbert (born 1854), who is regarded as one of the greatest figures in British sculpture; Harry Bates (1850-99), Sir George Frampton (born 1860); and W. R. Colton (born 1867).

English Channel, an arm of the Atlantic Ocean which separates England from France.

English Language.

The language spoken in England from the settlement of the Anglo-Saxons to the Norman Conquest (say 500-1066) is popularly known as Anglo-Saxon, through simply the earliest form of English. (See *Anglo-Saxons.*) It was a highly inflected and purely Teutonic tongue, presenting several dialects. The Conquest introduced the Norman-French, and from 1066 to about 1250, two languages were spoken, the native English speaking their own language, the intruders speaking French. During this period the grammatical structure of the native language was greatly broken up, inflections fell away, or were assimilated to each other; and towards the end of the period we find a few works written in a language resembling the English of our own day in grammar, but differing from it by being purely Saxon or Teutonic in vocabulary. Finally, the two languages began to mingle and form one intelligible to the whole population, Normans as well as English, this change being marked by a great infusion of Norman-French words, and English, as now constituted, being the result. English is thus, in its vocabulary, a composite language, deriving part of its stock of words from a Teutonic source and part from a Latin source, Norman-French being in the main merely a modified form of Latin. In its grammatical structure and general character, however, English is entirely Teutonic, and is classed with Dutch and Gothic among the Low German tongues. If we divide the history of the English language into periods we shall find three most distinctly marked: 1st, the Old English or Anglo-Saxon, extending down to about 1100; 2d, the Middle English, 1100-1400 (to this period belong Chaucer, Wickliffe, Langland); 3d, Modern English. A more detailed subdivision would give transition periods connecting the main ones. The chief change which the language has experienced during the modern period consists in its absorbing new words from all quarters in obedience to the requirements of advancing science, more complicated social relations, and increased subtlety of thought. At the present time the rapid growth of the sciences already existing, and the creation of new ones, have caused whole groups of words to be introduced, chiefly from the Greek.

English Literature.

Before any English literature, in the strict sense of the term, existed, four literatures had arisen in England—the Celtic, Latin, Anglo-Saxon and Anglo-Norman. The first includes such names as those of Taliesin, Llywarch Hen, Aneurin and Merlin or Merddhin. The Latin literature prior to the Conquest presents those of Aldhelm, Bede, Alcuin, Asser, Ethelwerd and Nennius. For Anglo-Saxon literature see the article *Anglo-Saxons.* With the coming of the Normans, although the *Anglo-Saxon Chronicle* was continued until 1154, the native language practically ceased for a time to be employed in literature, Latin being employed in law, history and philosophy, French in the lighter forms of literature. The Norman *trouvère* displaced the Saxon *scop*, or gleeman, introducing the *Fabliau* and the Romance. By the *Fabliau* the literature was not greatly influenced until the time of Chaucer; but the Romance attained an early and striking development in the Arthurian cycle, founded upon the legends of Geoffrey of Monmouth's Latin *History of the Britons* (1147), by Geoffrey Gaimar, Maistre Wace, Walter Map and other writers of the twelfth century. The Latin literature included important contributions to the Scholastic philosophy by Alexander Hales (d. 1245), Duns Scotus (d. 1308), and William of Occam (d. 1347), the philosophic works of Roger Bacon (1214-92), the Golias poems of Walter Map, and a long list of chronicles or histories, either in prose or verse, from Geoffrey of Monmouth to Matthew Paris.

Apart from a few brief fragments, the first English writings after the Conquest are the *Brut* of Layamon (about 1200), based on the *Brut* of Wace; and the *Ormulum*, a collection of metrical homilies attributed to Orm or Ormin, an Augustine monk. Next in importance come the rhyming chronicles, Robert of Gloucester (time of Henry III, Edward I), and Robert of Brunne or Mannyng (d. 1340), with other writers of minor consequence. Between the beginning and middle of the fourteenth century the English speech had entered upon a new phase of development in the absorption of Norman-French words. A rapid expansion of the literature followed, having as the foremost figure that of Chaucer (1340-1400), who, writing at first under French influences, and then under Italian, became in the end the most representative English writer of the time. Contemporary with him were the poets William or Robert Langland (1332-1400), John Gower (1325-1408), John Barbour (1316-95). In prose the name of John Wickliffe (1324-84) is preëminent, the English

version of *Mandeville's Travels* being apparently of later date.

The period from the time of Chaucer to the appearance of Spenser, that is, from the end of the fourteenth to near the end of the sixteenth century, is a very barren one in English literature, in part probably owing to foreign and domestic wars, the struggle of the people to advance their political power, and the religious controversies preceding and attending the Reformation. The immediate successors of Chaucer, Occleve (1370-1454) and Lydgate (d. 1460), were not men of genius, and the center of poetic creation was for the time transferred to Scotland, where James I headed the list which comprises Andrew de Wyntoun, Henry the Minstrel or Blind Harry, Robert Henryson, William Dunbar, Gavin Douglas and Sir David Lyndsay. In England the literature was chiefly polemical, the only noteworthy prose prior to that of More being that of Reginald Peacock, Sir John Fortescue, the Paston Letters and Malory's Morte Darthur (completed 1469-70); the only noteworthy verse, that of John Skelton.

It was now that several events of European importance combined to stimulate life and enlarge the mental horizon—the invention of printing, or rather of movable types, the promulgation of the Copernican system of astronomy, the discovery of America, the Rennaissance and the Reformation. The Renaissance spread from Florence to England by means of such men as Colet, Linacre, Erasmus and Sir Thomas More (1480-1535), the last noteworthy as being at the head of a new race of historians. Important contributions to the prose of the time were the Tyndale New Testament, printed in 1525, and the Coverdale Bible (1535). The first signs of an artistic advance in poetic literature are to be found in Wyatt (1503-42) and Surrey (1516-47), who nationalized the sonnet, and of whom the latter is regarded as the introducer of blank verse. The drama, too, had by this time reached a fairly high stage of development. The *mystery* and *miracle* plays, after the adoption of the vernacular in the fourteenth century, passed from the hands of the clergy into those of the laity, and both stage and drama underwent a rapid secularization. The *morality* began to embody matters of religious and political controversy, historical characters mingled with the personification of abstract qualities, real characters from contemporary life were introduced, and at length farces on the French model were constructed, the *Interludes* of John Heywood (d. 1565) being the most important examples. To Nicholas Udall (1504–56) the first genuine comedy, *Ralph Roister Doister*, was due, this being shortly afterwards followed by John Still's *Gammer Gurton's Needle* (1566). The first tragedy, the *Ferrex and Porrex*, or *Gorboduc*, of Sackville and Norton, was performed in 1561, and the first prose play, the *Supposes* of Gascoigne, in 1566. Gascoigne and Sackville were in other respects than drama noteworthy among the earlier Elizabethans; but the figures which bulk most largely are those of Sidney and Spenser. In drama Lyly, Peele, Greene, Nash and Marlowe are the chief immediate precursors of Shakespere, Marlowe alone, however, being at all comparable with the great master. Contemporary and later dramatic writers were Ben Jonson, the second great Elizabethan dramatist, Middleton, Marston (better known as a satirist), Chapman, Heywood, Dekker, Webster, Ford, Beaumont and Fletcher and Massinger. With these were a number of minor poets of some ability. In Elizabethan prose the prominent names are those of Roger Ascham, Lyly the Euphuist, Hooker, Raleigh and Bacon, the founder in some regards of modern scientific method. The issue of the authorized version of the Bible in 1611, may be said to close the prose list of the period.

After the death of James I the course of literature breaks up into three stages, the first from 1625 to 1640, in which the survivals from the Elizabethan age slowly die away. The 'metaphysical poets,' Cowley, Wither, Herbert, Crashaw, Habbington and Quarles, and the cavalier poets, Suckling, Carew, Denham, all published poems before the close of this period, in which also Milton's early poems were composed and the *Comus* and *Lycidas* published. The second stage (1640-60) was almost wholly given up to controversial prose, the Puritan revolution checking the production of pure literature. In this controversial prose of the time Milton was easily chief. With the restoration a third stage was begun. Milton turned his new leisure to the composition of his great poems; the drama was revived, and Davenant and Dryden, with Otway, Southerne, Etherege, Wycherley, Congreve, Vanbrugh and Farquhar in their first plays, and minor playwrights, are the most representative writers of the period. Butler established a *genre* in satire, and Marvell as a satirist in some respects anticipated Swift; while in prose we have Hobbes, Clarendon, Fuller, Browne, Walton, Cotton, Pepys, Evelyn,

Bunyan, Locke and a crowd of theological writers, of whom the best known are Jeremy Taylor ('Spenser of prose' and 'Shakespere of divines'), Richard Baxter, Robert Barclay, William Penn, George Fox, Isaac Barrow, John Tillotson, Stillingfleet, Bishop Pearson, Sherlock, South, Sprat, Cudworth and Burnet. Other features of the last part of the seventeenth century were the immense advance in physical science under Boyle, Isaac Newton, Harvey and others, and the rise of the newspaper press.

Dryden's death in 1700 marks the commencement of the so-called Augustan age in English literature. During it, however, no greater poet appeared than Pope, in whom sagacity, wit and fancy take the place of the highest poetic faculty, but who was a supreme artist within the formal limits of his conception of metrical art. Against these formal limits signs of reaction are apparent in the verse of Thomson, Gray, Collins, Goldsmith and in the productions of Macpherson and Chatterton. The poets, Prior, Gay and Ambrose Phillips inherit from the later seventeenth century, Gay being memorable in connection with English opera; and there was a large number of small but respectable poets. It is in prose that the chief development of the eighteenth century is to be found. Defoe and Swift led the way in fiction and prose satire; Steele and Addison, working on a suggestion of Defoe, established the periodical essay; Richardson, Fielding, Smollett and Sterne raised the novel to sudden perfection. Goldsmith also falls into the fictional group as well as into those of the poets and the essayists. Johnson exercised during the latter part of his life the power of a literary director, with Boswell as literary dependent. The other chief prose writers were Bishop Berkeley, Arbuthnot, Shaftesbury, Bolingbroke, Burke; the historians Hume, Robertson and Gibbon; the political writers Wilkes and Junius; the economist and moral philosopher Adam Smith; the philosophical writers Hume, Bentham and Stewart; the scholars Bentley, Sir William Jones and Richard Porson; the theologians Atterbury, Butler, Warburton and Paley; and some inferior playwrights, of whom Rowe, John Home, Colley Cibber, Colman the elder, Foote and Sheridan were the most important.

With the French Revolution, or a few years earlier, the modern movement in literature may be said to have commenced. The departure from the old traditions, traceable in Gray and Collins, was more clearly exhibited in the last years of the eighteenth century in Cowper and Burns, and was developed and perfected in the hands of Blake, Bowles, and the 'lake poets' Wordsworth, Coleridge and Southey; but there were at first many survivals from the poetic manner of the seventeenth century, such as Erasmus Darwin, John Wolcot, Robert Bloomfield and Samuel Rogers. Among the earlier poets of the nineteenth century, also, were Crabbe, Scott, Hogg, Campbell, Montgomery, Mrs. Hemans, Procter ('Barry Cornwall'), Milman, L. E. Landon, Joanna Baillie and Robert Montgomery. A more important group was that of Byron, Shelley and Keats, with which may be associated the less notable names of Leigh Hunt, Thomas Moore and Landor, Among the earlier writers of fiction there were several women of note, such as Maria Edgeworth and Jane Austen. The greatest name in fiction is unquestionably that of Scott. Other prose writers were Mackintosh, Malthus, Hallam, James Mill, Southey, Robert Hall, John Foster, Thomas Chalmers, Hannah More, Cobbett, William Hazlitt, Sydney Smith, Francis Jeffrey and Lord Brougham. In the literature after 1830 poetry included among its prominent names those of Praed, Hood, Aytoun, Lord Houghton, Sidney Dobell, Alexander Smith, Gerald Massey, Charles Mackay, Philip James Bailey, William Allingham, Elizabeth Barrett Browning, Coventry Patmore, Lord Lytton (Owen Meredith), Arthur Hugh Clough, Matthew Arnold, Dante G. Rossetti, Robert Buchanan, William Morris, Lewis Morris, Jean Ingelow, Swinburne and last and greatest, Tennyson and Browning. A brilliant list of novelists for the same period includes Marryat, Bulwer, Disraeli, Dickens, Thackeray, Charles Kingsley, Charlotte Brontë, and a large number of later writers of distinction. To the historical and biographical list belong Alison, Macauley, Buckle, Carlyle, Thirwall, Grote, Milman, Froude, Lecky, Kinglake, Green, Freeman, Stubbs, etc. In science and philosophy, among the chief writers have been Whewell, Sir William Hamilton, Mansel, John Stuart Mill, Alexander Bain, Hugh Miller, Charles Darwin, Huxley, Tyndall, Max Müller, Herbert Spencer and T. H. Green. Among other prose writers of importance may be named De Quincey, Harriet Martineau, Sir Arthur Helps, Ruskin and Matthew Arnold. A large and increasing number of writers of American and colonial birth have to be added to the native contributors to present English literature in

its widest sense. (See *United States.*)

Engraving (en-grāv'ing), the art of representing objects and depicting characters on metal, wood, precious stones, etc., by means of incisions made with instruments variously adapted to the substances operated upon and the description of work intended. Impressions from metal plates are named engravings, prints or plates, those printed from wood being called indifferently wood engravings and wood cuts. While, however, these impressions are not altogether dissimilar in appearance, the processes are distinct. In plates the lines intended to print are incised, and in order to take an impression the plate is daubed over with a thick ink, which fills all the lines. The surface is then wiped perfectly clean leaving only the incised lines filled with ink. A piece of damp paper is now laid on the face of the plate, and both are passed through the press, which causes the ink to pass from the plate to the paper. This operation needs to be repeated for every impression. In the wood block, on the contrary, the spaces between the lines of the drawing are cut out, leaving the lines standing up like type, the printing being from the inked surface of the raised lines, and effected much more rapidly than plate printing.

Engraving on wood, intended for printing or impressing from, long preceded engraving on metals. The art is of Eastern origin, and at least as early as the tenth century engraving of and printing from wood blocks were common in China. We first hear of wood engraving being cultivated in Europe by the Italians and Germans of the thirteenth century. For a hundred and fifty years, however, there is small indication of the practice of the art, which was at first confined to the production of block-books, playing cards and religious prints. In the fifteenth century the art of printing from engraved plates was discovered in Florence by Maso Finiguerra. Engraving had long been used as a means of decorating armor, metal vessels, etc., the engravers generally securing duplicates of their works before laying in the niello (a species of metallic enamel) by filling the lines with dark color, and taking casts of them in sulphur. The discovery of the practicability of taking impressions upon paper led to engraving upon copper plates for the purpose of printing. The date of the earliest known niello proof upon paper is 1452. The work of the Florentine engravers, however, was almost at once surpassed in Venice and elsewhere in North Italy by Andrea Mantegna (1431-1505), Girolamo Mocetto, Giovanni Batista del Porto and others. In Marc Antonio Raimondi (1475-1534), who wrought under the guidance of Raphael, and reproduced many of his works, the art reached its highest point of the earlier period, and Rome became the center of a new school, which included Marco da Ravenna (d. 1527), Giulio Bonasone (1531-72), and Agostino de Musis (fl. 1536). In the meantime, in Germany the progress of the art had been not less rapid. Of the oldest schools, the most important engraver is Martin Schongauer (1420-88). He was, however, surpassed a generation later by Albert Durer (1471-1528), who excelled both in copper and wood engraving, especially in the latter. Among his most famous contemporaries and successors were Burgkmair and Lucas Cranach. The Dutch and Flemish schools, of which Durer's contemporary, Lucas van Leyden, was the head, did much to enlarge the scope of the art, either by paying increased attention to the rendering of light and shade, and the expression of local color, as in the case of Cornelius Cort and Bloemart or by developing freedom and expression of line, as in the case of Goltzius and his pupils. Rubens (1577-1640) influenced engraving through the two Bolswerts, Vorstermann, Pontius and P. de Jode, who engraved many of his works on a large size. Towards the end of the seventeenth century etching, which had before been rarely used, became more common, and was practiced with great success by Rembrandt (1607-69) and other painters of that period. In France Noel Garnier founded a school of engraving about the middle of the sixteenth century; but it produced no work of any high distinction until the reign of Louis XIV, when Nanteuil's pupil Gerard Edelinck and Gerard Audran flourished. The former was skilled in using his graver to produce color effects, the latter is famed for his engravings from Nicolas Poussin and Le Brun. But these were all surpassed about the middle of the eighteenth century by Wille (1717-1807), a German resident in Paris. Before the middle of the seventeenth century England produced little noteworthy work, availing herself principally of the work of foreign engravers, of whom many took up temporary and even permanent residence. The first English engraver of marked importance was William Hogarth (1697-1764), whose works are distinguished for character and expression. Vivares (1712-82), a Frenchman by

birth, laid the foundation of the English school of landscape engraving, which was still further developed by William Woollet (1735-85), who was also an excellent engraver of the human figure. In historical engraving a not less remarkable advance was made by Sir Robert Strange (1721-92), and Richard Earlom (1743-1822) produced some admirable works in mezzotint. In succession to these came William Sharp (1746-1824), James Bazire (1730-1802), Bartolozzi (1727-1815), James Heath, Bromley, Raimbach and others. The substitution of steel for copper plates (1820-30) gave the power of producing a much larger number of fine impressions and opened new possibilities for highly finished work. During the closing years of the eighteenth century line engraving attained a depth of color and fullness of tone in which earlier works generally are deficient, and during the nineteenth century it reached a perfection of finish which it had not previously attained. A picture, whether figure or landscape, may be translated by line engraving with all its depth of color, delicacy of tone, and effect of light and shade; the various textures, whether of naked flesh, silk, satin, woolen or velvet, all successfully rendered by ingenious modes of laying the lines and combinations of lines of varying strength, width and depth. Among engravers who have produced historical works of large size and in the line manner the names of Raphael Morghen, Longhi, Anderloni, Garavaglia and Toschi, in Italy; of Forster, Henriquel-Dupont, Bridoux and Blanchard, in France; of Burnet, Robinson, Doo, Watt and Stocks, in England, stand preeminent. In the period 1820-60 landscape engraving attained a perfection in Great Britain which it had not attained in any other country or at any other time. Among landscape engravers the names of Geo. Cooke, William Miller, Goodall, Cousen, Brandard and William Forrest hold the foremost places. In mezzotinto engraving Samuel Cousins is unrivaled. In the period 1830-45 various publications called *Annuals*, composed of light literature in prose and verse, and illustrated by highly finished engravings in steel, were very popular. The engravings were necessarily of small size, and are generally of great excellence. A number of them, both figure and landscape, are executed with such finish and completeness as to be esteemed perfect works. The unrivaled illustrations of Rogers' *Poems* and Rogers' *Italy* after Turner and Stothard belong to this period. Many of the originals of the engravings in the *Annuals* were finished pictures of large size. A great part of the difficulty in engraving on a small scale from a large picture consists in determining what details can be left out and withal preserve the full effect and character of the original. After 1870 many plates were produced by a combination of etching and dry point, a comparatively cheap and rapid process. Such works became fashionable and very popular with collectors. But while some of them have been excellent of their kind, the process is of limited resource, and the best works in this manner will not stand comparison with the masterpieces of line engraving.

Line Engraving, as implied by the term, is executed entirely in lines. The tools are few and simple. They consist of the graver or *burin*, the point, the scraper and the burnisher; an oil-stone or hone, dividers, a parallel square, a magnifying lens; a bridge on which to rest the hand; a blind or shade of tissue paper, to make the light fall equally on the plate, callipers for leveling important erasures, a small steel anvil, a small pointed hammer and punches. In etching, the following articles are required:—a resinous mixture called etching-ground, capable, when spread very thinly over the plate, of resisting the action of the acids used; a dauber for laying the ground equally; a handvise; some hair pencils of different sizes, and bordering wax, made of burgundy pitch, bee's-wax and a little oil.

In engraving, the plate, which is highly polished and must be free from all scratches, is first prepared by spreading over it a thin layer of *ground*. The surface is then smoked, and one outline of the picture transferred to it by pressure from the paper on which it has been drawn in fine outlines by a black lead pencil. The picture is then drawn on the ground with the etching needle, which removes the ground in every form produced by it, and leaves the bright metal exposed. A bank of wax is then put round the plate and diluted acid poured on it, which eats out the metal from the lines from which the ground has been removed, but leaves the rest of the plate untouched. The plate is then gone over with the graver, the etched lines clearly defined, broken lines connected, new lines added, etc. Sometimes the plate is *rebitten* more than once, those parts which are sufficiently bitten in the first treatment being *stopped* with varnish, and only the selected parts exposed to after-biting. Finally, the burnisher is brought into play alternately with the

graver and point to give perfectness and finish. Such is the process for landscape engraving. In historical and portrait engraving of the highest class the lines are first drawn on the metal with a fine point and then cut in by the graver, first making a fine line and afterwards entering and reëntering till the desired width and depth of lines is attained. Much of the excellence of such engravings depends on the mode in which the lines are laid, their relative thickness, and the manner in which they cross each other. In historical engraving etching is but little used, and then only for accessories and the less important parts.

Soft-Ground Etching.—The ground, made by mixing lard with common etching-ground, is laid on the plate and smoked as before, but its extreme softness renders it very liable to injury. The outline of the subject is drawn on a piece of rough paper larger than the plate. The paper is then damped, and laid gently over the ground face upwards, and the margins folded over and pasted down on the back of the plate. When the paper is dry, and tightly stretched the bridge is laid across, and with a hard pencil and firm pressure the drawing is completed in the usual manner. The pressure makes the ground adhere to the back and the paper at all parts touched by the pencil, and on the paper being lifted carefully off, these parts of the ground are lifted with it, and the corresponding parts of the plate thus left bare are exposed to the subsequent action of the acid. The granulated surface of the paper, causing similar granulations in the touches on the ground, gives the character of a chalk-drawing. The biting-in is affected in the same manner as already described, and the subject is finished by rebiting and dotting with the graver.

Stipple or Chalk Engraving, in its pure state, is exclusively composed of dots, varying in size and form as the nature of the subject demands, but few stipple plates are now produced without a large admixture of line in all parts, flesh excepted. A great advance, however, has been made in stipple engraving by the introduction of large and varied forms of dotting in the draperies, the results almost rivaling line engraving in richness and power.

The processes of *Aquatint* and *Mezzotint* will be found described under their respective heads, the latter differing from all other styles of engraving in that the lights and gradations are scraped or burnished out of a dark ground that has first been wrought upon the plate, instead of the forms being corroded or cut into a plain surface.

The Mixed Style is based on mezzotinto, which, still forming the great mass of shading, is in this method combined with etching in the darker, and stipple in the more delicate parts. By this combination a plate will produce a larger number of good impressions than were it done entirely in mezzotinto.

Engraving on Wood.—The wood best adapted for engraving is box. It is cut across the grain in thicknesses equal to the height of type, these slices being subjected to a lengthened process of seasoning, and then smoothed for use. Every wood engraving is the representative of a finished drawing previously made on the block; the unshaded parts being cut away, and the lines giving form, shading, texture, etc., left standing in relief by excavations of varied size and character, made between them by gravers of different forms. Drawings on wood are made either with black-lead pencil alone or with pencil and India ink, the latter being employed for the broader and darker masses. It is now much the practice to photograph drawings made in black and white upon the wood instead of making the drawing on the wood block. When the drawing is put on the wood by washes or by photography instead of being entirely done by pencil lines, the engraver has to devise the width and style of lines to be employed instead of cutting in facsimile, as is the case when the drawing is made entirely in lines. The tools required for wood engraving are similar but more numerous than those of the engraver on copper or steel. Within recent years new methods of reproduction of photographs for the purpose of printing have largely replaced the art of wood engraving, and threaten to put an end to the whole art of the engraver, except in so far as it is used for the improvement of the photographic prints. The cheapness and close reproduction of nature attained by these processes have made them popular alike with publishers and readers, and books are very generally illustrated by photographic reproductions. (See also *Die-sinking*, *Gems.*)

Engrossing (en-gros'ing), in law, denotes *extending* a deed, that is, rewriting it out fully in fair and legible characters.

Engrossing, Forestalling, and Regrating, terms formerly in use for the purchase of corn or other commodities in order to sell again at a higher price, or in order to raise the

market price of the same. These practices were once regarded as criminal, and positive statutes against them were passed in England in 1266-67, in 1350-52, in 1552, in 1562 and in 1570. The offense of *engrossing* was described by the statute of Edward III, as the 'getting into one's possession, or buying up large quantities of corn, or other dead victuals, with intent to sell them again.'; *forestalling*, as the 'buying or contracting for any cattle, merchandise or victual, coming in the way to the market, or dissuading persons from bringing their goods or provisions there; or persuading them to enhance the price when there'; and *regrating*, 'the buying of corn or other dead victual in any market and selling it again in the same market, or within 4 miles of the place.' By the statute of Edward VI, the engrossing of corn, which included the buying of it in one market to sell it in another, was made punishable by imprisonment and pillory: and no one could carry corn from one part of the kingdom to another without a license. All the positive statutes against these offenses were repealed in 1772, but they were still found to be punishable by common law, and it was not till 1844 that they entirely ceased to rank among offenses.

Enharmonic (en-hâr-mon'ik), in music, is an epithet applied to intervals smaller than the regular divisions of the scale, *i. e.*, less than semitones. Enharmonic intervals can be produced on stringed instruments, or on specially constructed fixed-tone instruments having more than twelve divisions in the octave.

Enid (ē'nid), a city, capital of Garfield Co., Oklahoma. It has tile and iron works, lumber and flour mills, etc. Pop. 13,799.

Enkhuizen (engk'hoi-zn), a seaport of Holland, on a projection in the Zuider Zee, 29 miles northeast of Amsterdam. It had formerly a pop. of 40,000, but the silting up of the harbor has caused its decay, and its inhabitants number now 6865.

Enlistment (en-list'ment), the voluntary contract by which men are enrolled in the military or naval forces of a country, as distinguished from *conscription* (*q. v.*). In the United States and Great Britain voluntary enlistment takes the place of conscription except in time of war. In the United States men are enlisted in the Regular Army for seven years (four years in active service and three in the reserve). Duration of service in the enlisted army of Great Britain is for twelve years (three, five or nine years may be in the reserve). Men are enlisted in the Navy and Marine Corps of the United States to serve for four years.

Enlistments during the Civil War IN THE UNITED STATES. The 'calls' for troops by the government during the Civil war were as follows: April 15, 1861, 75,000 for three months; number enlisting, 93,326. May and June 25, 1862, 530,000 for three years; enlistments, 714,213. July 2, 1862, 300,000 for three years; enlistments, 431,958. August 4, 1862, 300,000 for nine months; enlistments, 87,000. The 'calls' from October 17, 1863, were orders for drafts; on that day was issued a 'call' for 300,000 for three years, and February 1, 1864, a 'call' for 200,000 for the same term—these two 'calls' bringing 374,807 into service. March 14, 1864, 200,000 men were called for, for three years, resulting in 284,021 entering the service. July 18, 1864, 500,000 men for 1, 2 and 3 years were called for; number obtained, 384,882. The last 'call,' December 19, 1864, for 300,000, for 1, 2 and 3 years, brought 204,568 into service. The whole number called for was 2,759,049; number obtained, 2,656,553. Probably not more than 50,000 drafted men performed personal service, substitutes being obtained. The 'substitute fund,' consisting of money paid as a release from service, which was used as a 'bounty fund' for volunteers, amounted to $25,902,000.

Ennis, a city of Ellis Co., Texas, 34 miles S. of Dallas. It has cotton gins, oil and lumber mills, etc. Pop. 5669.

Ennius (en'ni-us), QUINTUS, an early Latin poet, considered by the Romans as the father of their literature, was born at Rudiæ, near Brundusium, in 239 B.C.; died in 169 B.C. He wrote an epic, *Scipio*, in hexameters; Roman annals, tragedies and comedies, satires, epigrams, precepts, etc. His whole works are supposed to have been extant up to the thirteenth century, but nothing now remains but fragments quoted from other ancient authors.

Enns (ens), a river in Austria, which rises in the Alps of Salsburg, flows N., then E. N. E., then N. N. W. entering Upper Austria (Ober der Enns), which for 15 miles it separates from Lower Austria (Unter der Enns), and finally enters the Danube a little below the town of Enns (4438 inhabitants). Total course about 160 miles.

Enoch (ē'nok). (1) The eldest son of Cain, who called the city which he built after his name (Gen., iv, 17).

(2) One of the patriarchs, the father of Methuselah. He 'walked with God; and he was not, for God took him' (Gen., v, 24), at the age of 365 years. The words quoted are usually interpreted to mean that Enoch did not die a natural death, but was removed as Elijah was.

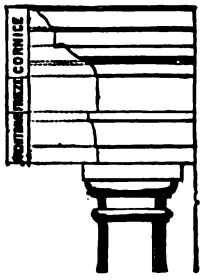
Enoch, Book of, an apocryphal book of an assumedly prophetical character, to which considerable importance has been attached on account of its supposed quotation by St. Jude in the 14th and 15th verses of his epistle. It is referred to by many of the early fathers; is of unknown authorship, but was probably written by a Palestinian Hebrew. Its date is also uncertain, critical conjecture ranging from 144 B.C. to 132 A.D. Until the close of last century it was known in Europe only by the references of early writers, and by the passage of St. Jude supposed to be founded on it. On his return from Egypt, Bruce brought with him from Abyssinia three manuscripts containing a complete Ethiopic translation of it. It has since been repeatedly published, translated and criticised in Europe.

Enos (ā'nōs), a seaport of European Turkey, in Roumelia, 38 miles N. W. of Gallipoli, on the Ægean Sea, in the Gulf of Enos. Pop. 8000.—The Gulf of Enos is 14 miles in length by about 5 in breadth.

Ensign (en'sīn), formerly, in the British army, the officer who carried the flag or colors of an infantry regiment; for this title, second lieutenant has been substituted. In the United States navy the office of ensign ranks next below that of lieutenant. In naval language the ensign is the flag over the poop or stern which distinguishes the ships of different nations.

Ensilage (en'si-lij), in agriculture, a mode of storing green fodder, vegetables, etc., in receptacles called 'silos.' These are usually elevated circular structures made of wood, brick concrete or stone. The fodder, etc., is cut and mixed, placed in the silo, pressed down, and kept compressed by its own weight until in a state fit for feeding. It undergoes a slight fermentation, and attains a slightly acid taste and smell, which is particularly grateful to cattle. The modern system of ensilage dates from about 1875, but the practice was known to the ancient Romans, and the system has been common in Mexico for centuries. Such advantages are claimed for it, as that in a wet season grass can be made into ensilage instead of hay, and that there is little loss of nutritive elements, while it has great feeding powers. Recent experiences seem to show that green fodder may be converted into ensilage by simply piling up and consolidating by pressure, though the method is wasteful.

Entablature (en-tab'la-tör), in architecture, the horizontal, continuous work which rests upon a row of columns, and belongs especially to classical architecture. It consists of three principal divisions—the *architrave* immediately above the abacus of the column, next the *frieze*, and then the *cornice*. In large buildings projections similar to and known also as entablatures are often carried round the whole edifice, or along one front of it.



Entablature of Tuscan Column.

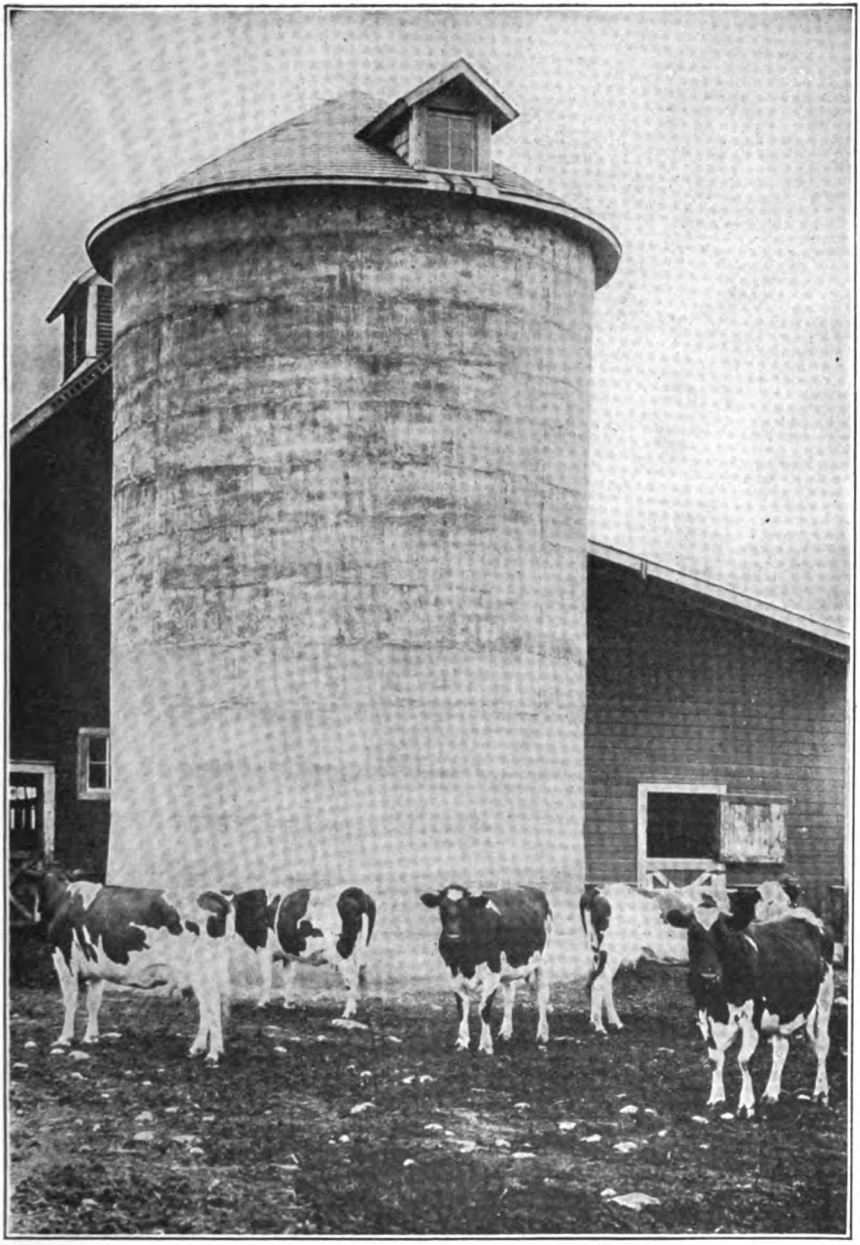
Entada (en-tā'da), a genus of leguminous plants, suborder Mimoseæ, containing about a dozen species of climbing, tropical shrubs, remarkable for the great size of their pods. *E. scandens* has pods which measure from 6 to 8 feet in length. The seeds have a hard, woody and beautifully polished shell, and are often made into snuff-boxes, scent-bottles, etc.

Entail (en-tāl'), in law, the settlement of an estate by which a freehold is limited to a person and the heirs of his body, with such particular restrictions as the donor may specify. Entailed estates are divided into *general* and *special*, the former when the estate is given to the donee and his heirs without exception, the latter when the estate is limited to certain heirs to the exclusion of others.

Entasis (en'ta-sis), in architecture, the delicate and almost imperceptible swelling of the lower part of the shaft of a column, to be found in almost all the Grecian examples, adopted to give a more pleasing effect to the eye.

Entelechy (en-tel'e-ki), in the peripatetic philosophy, an object in its complete actualization, as opposed to merely potential existence.

Entellus (en-tel'us), an East Indian species of monkey, of the genus *Semnopithēcus* (*S. entellus*). It has yellowish fur, with a face of a violet tinge, and a long and powerful tail, which, however, is not prehensible. It receives divine honors from the natives of India, by whom it is termed *Hoonuman*.



A CONCRETE SILO

Although the cost of this reinforced concrete construction is slightly higher than wood, it has the advantage of being fireproof, airtight and rot proof. It cannot be blown down by wind.

Costly temples are dedicated to these animals; hospitals are built for their reception, and large fortunes are bequeathed for their support. The entellus abounds in India; enters the houses and gardens of the natives, plunders them of fruit and eatables, and the visit is even considered an honor.

Enteric Fever (en-ter'ik). See *Typhoid Fever.*

Enteritis (en-te-rī'tis; Greek, *enteron*, intestine), inflammation of the intestines. There are several forms of the disease of great severity and very fatal. A common form, which is of the nature of an intestinal cartarrh, generally yields to simple treatment; but other forms are of great danger, and demand skilled and attentive treatment.

Entomology (en-tu-mol'u-ji), the branch of zoology which treats of the insects, the name being from Greek *entŏma*, animals 'cut in,' the transverse division or segmentation of the body being their most conspicuous feature. The true insects are those animals of the division Arthropoda or Articulata distinguished from the other classes of the division by the fact that the three divisions of the body—the head, thorax and abdomen—are always distinct from one another. There are never more than three pairs of legs in the perfect insect, and these are all borne upon the thorax. Each leg consists of from six to nine joints. The first of these is called the 'coxa,' and is succeeded by a short joint called the 'trochanter.' This is followed by a joint, often of large size, called the 'femur,' succeeded by the 'tibia,' and this has articulated to it the 'tarsus,' which may be composed of from one to five joints. Normally two pairs of wings are present, but one or other may be wanting. The wings are expansions of the sides of the second and third sections of the thorax, and are attached by slender tubes called 'nervures.' In the beetles the anterior pair of wings becomes hardened so as to form protective cases for the posterior membranous wings, and are called in this condition 'elytra' or 'wing-cases.' Respiration is effected by means of air tubes or tracheæ, which commence at the surface of the body by lateral apertures called 'stigmata' or 'spiracles,' and ramify through every part of the body. The head is composed of several segments amalgamated together, and carries a pair of feelers or 'antennæ,' a pair of eyes, usually compound, and the appendages of the mouth. The thorax is composed of three segments, also amalgamated, but generally pretty easily recognized. The abdominal segments are usually more or less freely movable upon one another, and never carry locomotive limbs; but the extremity is frequently furnished with appendages connected with generation, and which in some cases serve as offensive and defensive weapons (stings). The organs of the mouth take collectively two typical forms, the masticatory and the suctorial, the former exemplified by the beetles, the latter by the butterflies, in which the mouth is purely for suction. The alimentary canal consists of the œsophagus or gullet, a crop, a gizzard, a stomach and an

FIGURE SHOWING PARTS OF INSECTS.

Coleopter (*Cicindela campestris*). *a*, Head. *b*, Thorax. *c*, Abdomen. *d d*, Elytra. *e e*, Wings. *f f*, Antennæ.

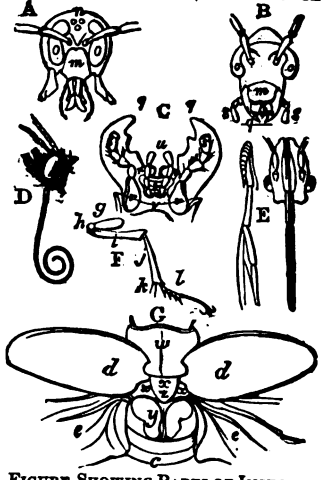


FIGURE SHOWING PARTS OF INSECTS.

A, B, C, Mandibulate Mouth. A, Head of Hornet, and upper side of mouth. *m*, Clypeus. *n*, Ocelli, stemmata, or simple eyes. *o*, Compound eyes. B, Head of Beetle, and C, under side of mouth of Beetle. *m*, Clypeus. *o*, Eyes. *p*, Labrum or upper lip. *q*, Mandibles or upper jaws. *r*, Maxillæ or lower jaws. *s*, Maxillary palpi. *t*, Labrum or under lip. *u*, Labial palpi. *v*, Mentum or chin.—D and E, Haustellate Mouths. D, Spiral sucker of a Butterfly, called also Antlia. E, Straight sucker of a Plant-bug (Pentatoma) called Haustellum.—F, Leg of Stag-beetle. *g*, Coxa. *h*, Trochanter. *i*, Femur. *j*, Tibia. *k*, Calcaria or spurs. *l*, Tarsus, which in this instance is pentamerous, or consisting of five pieces.—G, Thorax of Stag-beetle. *c*, Abdomen, *dd*, Elytra. *ee*, Wings. *w*, Prothorax. *x*, Mesothorax. *y*, Metathorax. *y*, Scutellum.

intestine, terminating in a cloaca. There is no regular system of blood-vessels; the most important organ of the circulation is a contractile vessel situated dorsally and called the 'dorsal vessel.' The nervous system is mainly composed of a series of ganglia placed along the ventral aspect of the body and connected by a set of double nerve cords. The sexes are in different individuals, and most insects are oviparous. Reproduction is generally sexual, but non-sexual reproduction also occurs. (See *Parthenogenesis.*) Generally the young are very different from the full-grown insect, and pass through a 'metamorphosis' before attaining the

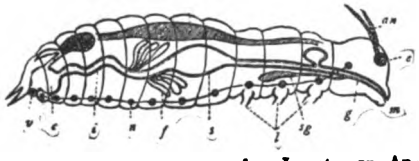


Diagram of the anatomy of an Insect. *an*, Antennæ; *e*, Eye; *m*, Mouth; *g*, Gullet; *sg*, Salivary gland; *s*, Stomach; *f*, Tubes supposed to represent the kidneys; *i*, Intestines; *c*, Chamber (cloaca) into which the intestine opens; *v*, Vent; *h*, Heart; *n*, Nervous system; *l*, Bases of the legs.

mature stage. When this metamorphosis is complete it exhibits three stages—that of the larva, caterpillar or grub, that of the pupa or chrysalis, and that of the imago or perfect winged insect. Insects have been divided into three sections—*Ametabŏla*, *Hemimetabŏla* and *Holmetabŏla*, according as they undergo no metamorphosis, an incomplete one, or a complete one. The young of the Ametabola differ from the adult only in size. They are all destitute of wings; the eyes are simple and sometimes wanting. The *Hemimetabŏla* undergo an incomplete metamorphosis, the larva differing from the imago chiefly in the absence of wings and in size. The pupa is usually active, or if quiescent capable of movement. In the *Holometabŏla* the metamorphosis is complete, the larva, pupa and imago differing greatly from one another in external appearance and habits. The larva is wormlike and the pupa quiescent. The section *Ametabŏla* (which, in the opinion of many naturalists, are scarcely within the pale of the true *Insecta*) is divided into three orders —*Anoplūra* (lice), *Mallophaga* (bird-lice), and *Physanūra* (*springtails*). The section *Hemimetabŏla* comprises the orders *Hemiptĕra* (cicadas, bugs, plant lice, etc.), *Orthoptĕra* (cockroaches, crickets, grasshoppers, locusts, earwigs etc.), and *Neuroptĕra* (dragon-flies, May-flies, white ants, etc.). The *Holometabŏla* comprises the orders *Aphaniptĕra* (fleas), *Diptĕra* (gnats, botflies, gadflies, mosquitoes, house-flies, etc.), *Lepidoptĕra* (butterflies and moths), *Hymenoptĕra* (bees, wasps and ants), *Strepsiptĕra* (stylops, minute and parasites), and *Coleoptĕra*, (lady-birds, glowworms, cockchafers, weevils, and all of the beetle tribe). A division is sometimes made into *Mandibulate* and *Haustellate* groups, the oral apparatus of the former being adapted for mastication, the latter for imbibition of liquid food. Both types are, however, sometimes modified. and occasionally combined.

Entomology, Economic. Insects of various species are very destructive to trees and cultivated plants, and the ravages committed by them on farms cause losses amounting to many millions of dollars annually. The terrible losses caused by great swarms of locusts have been historical for centuries, and in our day there is scarcely a cultivated plant that escapes injury by some insect species. Within recent years certain species of moths have been introduced to this country, the larvæ of which are doing very serious injury to forest and shade trees. In addition are the clothes moth and other insects which attack furniture, the botflies which attack horses, sheep and cattle, and the species of mosquitoes which spread epidemic dieases, such as yellow fever and malaria, among men. Injurious insects are very numerous in species and countless in numbers, and the study of their habits and of the best way to prevent their ravages has given rise to a broad field of entomological study. In many cases very encouraging success has been attained, in others the difficulty in dealing with destructive and disease-bearing insects has proved almost insuperable. The common house-fly is one of the species against which a crusade has recently been instituted, it being known to convey the germs of disease on its feet. Much has been done in the field of economic entomology, but much remains to be done and the war against hurtful insects goes actively on.

Entomophaga (en-tu-mof'a-ga; 'insect eaters'), a term applied to (1) a group of hymenopterous insects whose larvæ feed upon living insects. (2) A tribe of marsupials, as the opossums, bandicoots, etc., which are insectivorous, though not exclusively so. (3) A section of the edentates, as the ant-eater and pangolin.

Entomostraca (en-tu-mos'trà-kà), a sub-class of the crustaceous animals, composing all ex-

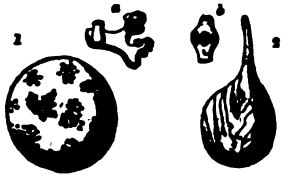
cept the stalk-eyed and sessile-eyed groups. The groups usually noted by it are the *Ostracōda*, as *Cypris; Copepōda*, as *Cyclops; Cladocēra*, as *Daphnia* (water-flea); *Branchiopōda*, as the brine-shrimp and the glacier-flea; *Trilobites*, all of which are extinct; *Merostomāta*, of which the king-crab is the only living genus. No definition can be framed to include all these groups, each of which is now usually regarded as a distinct order.

[Entomostraca.

1, *Cyclops quadricornis:* *a*, Eye; *e e*, Eggs. 2, Cypris: *a*, Eye.

Entophyte (en'tu-fīt), a term applied to minute plants growing on or in living animals, or in the tissues of other plants. They all belong to the orders Algæ or Fungi. In many cases the growth of the plant appears to be a consequence of the diseased state of the structure, which, in this condition, presents the circumstances favorable for the development of the germ or spore into the plant. Epidemic diseases, as cholera, have been ascribed to these spores of germs being conveyed through the air, water, etc. (See *Germ Theory.*)

Entozoa (en-tu-zō'a), a general name for those annulose parasitical animals which infest the bodies of other animals. Some are found in the intestines, other in the liver, brain, muscles and other tissues. They pass through



Entozoa Magnified.

1, *Cænūrus cerebrālis* (producing the staggers in sheep). *a*, Heads (shown on the surface) separately. 2, *Cysticercus cellulosæ* (causing the measles in pigs). *b*, Head.

different stages in their development, and at each stage occupy a different tissue and usually a different animal. Thus, the cystic or bladder worm, whose presence in the brain of sheep causes staggers, is the immature form of the tapeworm of the dog, etc. The number of species is being reduced as the relations of the different forms are studied. They all belong to the class *Scolēcida*, and are included in the orders *Trematōda* (flukes), *Tæniāda* (tapeworms), *Acanthocephāla* (intestinal worms), *Gordiacēa* (hairworms), and a section of the *Nematōda* (*Trichina*, etc.).

Entre Rios (en'tre rē'os; 'between rivers'), a province of the Argentine Republic, lying between the Uruguay and the Paraná; area estimated at 28,784 sq. miles; pop. 376,600. The province is largely pastoral. Capital, Conception, with pop. of 10,000.

Entropium (en-trō'pi-um), in medicine, an inversion or turning in of the eyelashes, consequent either on loss of substance or on inflammatory swelling of the lid.

Entropy (en-trō'pi), in thermodynamics, a certain mathematical expression whose value does not change when the substance under discussion undergoes a reversible compression or expansion, while not receiving any heat from external sources nor giving any up to them; but which is increased or diminished by the amount of heat entering or leaving the body. In general the change of entropy that a body experiences when it passes from one state to another by a reversible process is found by dividing the heat that the body absorbs during every infinitesimal part of the process of transformation by the absolute temperature of the body.

Environment (en-vī'ron-ment), a word frequently used in evolutionary and sociological discussions to signify the modifying influences of surroundings. No plant or animal can be understood as an entity, since the whole life is made up of action and reaction between the organism and its environment. There is great disagreement among scientists as to the relative part played by heredity and environment in determining what the individual shall be; but the influence of outside conditions has been recognized by naturalists from the time of Hippocrates down. Buffon, Treviranus and Geoffroy St. Hilaire regarded the surroundings as directly effecting changes in the organism; Erasmus Darwin and Lamarck, as indirectly effecting them. Charles Darwin allowed a measure of truth to both these positions.

Envoy (en'voi), a person deputed by a ruler or government to negotiate a treaty, or transact other business, with a foreign ruler or government. We usually apply the word to a public minister sent on a special occasion or for one particular purpose; hence an *envoy* is distinguished from an *ambassador* or permanent resident at a foreign court, and is of inferior rank.

Enzyme (en'zĭm), any of the unorganized ferments, such as diastase, cytase, trypsin, etc., which induce fermentive changes in organic substances. Under some conditions enzymes have the property of facilitating chemical interchanges between certain bodies without entering into the composition of the products that results. Enzymes play an important part in the digestive processes and are of vital importance in the life history of all plants. They are usually soluble in water and they generally lose their activity at a temperature above 100° F.

Eocene (ē'ō-sēn), in geology, a term applied to the lower division of the Tertiary strata, from Gr. *ēōs*, dawn, and *kainos*, recent, because remains of existing organic species first occur here. The Eocene beds are arranged in two groups, termed the Lower and Upper Eocene; the strata formerly called Upper Eocene being now known as Oligocene. They consist of marls, limestones, clays and sandstones, and are found in the Isle of Wight and in the southeast of England and northwest of France, in Central Europe, Western Asia, Northern Africa and the Atlantic coast of North America.

Eolian Harp (ē-ō-li'an). See *Æolian Harp*.

Eolithic Period (ē-ō-lith'ĭk), in archæology, the early part of the palæolithic period of prehistoric time.

Eon de Beaumont. See *D'Eon de Beaumont*.

Eos (ē'os), among the ancient Greeks the goddess of the dawn. See *Aurora*.

Eötvös (eut'veush), Baron Jozsef, a Hungarian statesman and author, born in 1813; died in 1871. He completed his studies at the University of Pesth in 1831. He had already, before leaving the university, produced three dramas—*The Critics*, *The Wedding* and *Revenge*, the last a tragedy—all which were well received. He became a friend of Kossuth, and distinguished himself as a journalist and author of the popular party. He was minister of public instruction in 1848, but resigned the same year. In 1867 he was again appointed minister of public instruction, which place he retained till his death. Among his works are the novels: *The Carthusian*, *The Village Notary* (translated into English), and *Hungary in 1514*—giving vivid pictures of Hungarian life in modern and more remote epochs.

Eozoic Rocks (ē-o-zō-ik), the name given to the oldest fossiliferous rocks, such as the Laurentian and Huronian of Canada, from their being supposed to contain the first or earliest traces of life in the stratified systems.

Eozoön (ē-o-zō'on), a supposed gigantic fossil foraminifer found in the limestone of the Laurentian rocks of Canada, whence the name *Eozoön Canadense;* and in the Archæan rocks of Germany; so called from Gr. *ēōs*, dawn, and *zōon*, an animal, as being the oldest form of life traceable in the past history of the globe. It is very doubtful, however, that these are true fossils, geologists now generally regarding them as of mineral origin.

Epacris (e-pac'ris), a genus of monopetalous exogens, the typical genus of the nat. order Epacridaceæ, distinguished by having a colored calyx with many bracts, a tubular corolla with smooth limb, stamens affixed to the corolla, and a five-valved, many-seeded capsule. The species are shrubby plants, with axillary, white, red or purple flowers, generally in leafy spikes. Among those cultivated in Britain we may mention *E. grandiflora*, which has flowers nearly an inch in length, of a brilliant reddish purple at the base and pure white at the apex. The order Epacridaceæ consists of plants allied to the heaths, chiefly natives of Australia. The fruit of some species is eaten under the name of Australian cranberry, and they are cultivated in greenhouses for their flowers.

Epacris grandiflora (garden variety).

Epact (ē'pakt; Gr. *epaktos*, added), in chronology, the excess of the solar month above the lunar synodical month, and of the solar year above the lunar year of twelve synodical months. The epacts then are *annual* and *menstrual* or *monthly*. Suppose the new moon to be on the 1st of January: the month of January containing 31 days, and the lunar month only 29 days, 12 hours, 44 minutes, 3 seconds; this difference, 1 day, 11 hours, 15 minutes, 57 seconds, is the *menstrual epact*. The *annual epact* is nearly 11 days; the solar year being 365 days, and the lunar year 354. The epacts were once of some importance in ecclesiastical chronology, being used for finding when Easter would fall.

Epaminondas (e-pa-mi-non'das), an ancient Greek hero, who, for a short time, raised his country Thebes, to the summit of power and prosperity. He was born about 418 B.C. and killed at the battle of Mantineia in 362 B.C. He took the leading part in the struggle during which Spartan supremacy in Greece was destroyed, and the supremacy of Thebes temporarily secured. Four times he successfully invaded the Peloponnesus at the head of the Thebans, but after his death Thebes soon sank to her former secondary condition. Throughout life he was distinguished for the friendship subsisting between him and Pelopidas, with whom he served in the Spartan campaign in 385 B.C. His character is one of the finest recorded in Greek history, and his virtues have been praised by both Xenophon and Plutarch.

Eparch (ep'ärk), in Greece, the governor or perfect of a provincial division called an *eparchy*, a subdivision of a monarchy or province of the kingdom. In Russia an eparchy is the diocese or archdiocese of a bishop or archbishop.

Epaulement (e-pąl'ment), in fortification, a term for the mass of earth or other material which protects the guns in a battery in front and on either flank.

Epaulet (ep'ąl-et), Ep'aulette (Fr. *épaule*, the shoulder), an ornamental shoulder-piece belonging to a military or other dress. Epaulettes were worn in the British army till 1855, and are still worn in the navy by all officers of and above the rank of lieutenant, and by some civil officers. From Britain they naturally made their way to the United States, and in fact are in general use in the armies and navies of modern nations.

Epée (ė-pā), Charles Michael, Abbe de l', a French philanthropist, born in 1712; died in 1789. He had chosen the clerical profession, but had to leave the church on account of Jansenist opinions. The great object of his life was the instruction of the deaf and dumb, for whom he spent his whole income, besides what was contributed by benevolent patrons, erecting an institution for them at his own cost. He left several works on his method of instruction. (See *Deaf and Dumb*.)

Epeira (e-pī'ra), a genus of spiders, comprising the largest and best-known European species. *E. diadĕma*, the common garden spider, is a handsomely marked species.

Eperjes (e-per'yesh), a town of Northern Hungary, on the Tarcza, the seat of a Greek Catholic bishop. Pop. 13,098.

Epernay (ep-er-nā), a town of N. E. France, department Marne, on the Marne, the central depôt of the wine trade of Champagne. The vast wine cellars of the town form a labyrinth of galleries cut in the tufa or calcareous soil of the district. Pop. (1906) 20,291.

Ephah (ē'fa), or Bath, a Hebrew measure of capacity, containing, according to one estimate or calculation, 8.6696 gallons; according to another only 4.4286 gallons.

Ephemera (e-fem'e-ra), the typical genus of the insect family Ephemeridæ, neuropterous insects, so named from the extreme shortness of their lives in the perfect state. They are known as *May-flies* or *day-flies*, and are characterized by the slenderness of their bodies; the delicacy of their wings, which are erect and unequal, the anterior being much the larger; the rudimentary condition of the mouth; and the termination of the abdomen in three filiform appendages. In the state of larvæ and pupæ they are aquatic and exist for years. When ready for their final change they creep out of the water, generally towards sunset of a fine summer evening, beginning to be seen generally in May. They shed their whole skin shortly after leaving the water, propagate their species, and die, taking no food in the perfect state. The May-fly is well known to anglers, who imitate it for bait.

Ephemeris (e-fem'e-ris), an astronomical almanac, such as the *Nautical Almanac and Astronomical Ephemeris*, published by order of the British Admiralty. (See *Almanac*.)

Ephesians (e-fēs'yans), The Epistle to the, a canonical epistle addressed by the apostle Paul to the church which he had founded at Ephesus. It was written during his first captivity at Rome, immediately after he had written the Epistle to the Colossians (A.D. 62); and was sent by the hands of Tychicus, who also bore the message to the church at Colossæ.

Ephesus (ef'e-sus), an ancient Greek city of Lydia, in Asia Minor, one of the twelve Ionian cities, on the south side of the Caystrus, near its mouth. It was at one time the grand emporium of Western Asia, having a convenient and spacious harbor. The apostle Paul visited Ephesus and established a Christian church there, to which he dedicated one of his epistles. It was famous for its temple of Artemis (Diana), called *Artemision*, the largest

and most perfect model of Ionic architecture, and reckoned one of the seven wonders of the world. The first great temple, begun about B.C. 650 and finished after 120 years, was burnt by the notorious Herostratus in order to perpetuate his name in B.C. 356 (the night of Alexander the Great's birth). A second and more magnificent was then erected, which was burned by the Goths in A.D. 262. Some interesting remains have recently been discovered by excavation. Several church councils were held there, especially the third ecumenical council of 431, at which Nestorius was condemned. The site of the city is now desolate; near it is a poor village, Aiasoluk.

Ephod (ef'od), a species of vestment worn by the Jewish high priest over the second tunic. It consisted of two main pieces, one covering the back the other the breast and upper part of the body, fastened together on the shoulders by two onyx stones set in gold, on each of which were engraved the names of six tribes according to their order. A girdle or band, of one piece with the ephod, fastened it to the body. Just above the girdle, in the middle of the ephod, and joined to it by little gold chains, rested the square breastplate with the Urim and Thummim. The ephod was originally intended to be worn by the high priest exclusively, but a similar vestment of an inferior material seems to have been in common use in later times among the ordinary priests.

Ephors (ef'ors), EPH'ORI, magistrates common to many Dorian communities of ancient Greece, of whom the most celebrated were the Ephori of Sparta. They were five in number, were elected annually, and both the judicial authority and the executive power were almost entirely in their hands. Their power became an intolerable burden, especially to the kings, and in 225 B.C. Cleomenes murdered the whole college and abolished the office.

Ephraem Syrus (e'fra-em si'rus), that is 'Ephraim the Syrian,' writer of the Syrian Church, born at Nisibis about 306 A.D.; died at Edessa in 373 or 378. He wrote several commentaries on Scripture, numerous homilies and other works (as well as hymns), which have come down to us partly in Syriac, partly in Greek, Latin and Armenian translations. His works have been published in Syriac, Greek and Latin.

Ephraim (e'fra-im), the younger son of Joseph, and the founder of one of the twelve tribes of Israel. When the Israelites left Egypt the Ephraimites numbered 40,500, and their possessions in the very center of Palestine included most of what was afterwards called Samaria.

Epic (ep'ik), a poem of the narrative kind. Some authorities restrict the term to narrative poems written in a lofty style and describing the exploits of heroes. Others widen the definition so as to include not only long, narrative poems of romantic or supernatural adventure, but also those of a historical, legendary, mock-heroic or humorous character. Epic is distinguished from drama in so far as the author frequently speaks in his own person as narrator; and from lyrical poetry by making the predominant feature the narration of action rather than the expression of emotion. Among the more famous epics of the world's literature may be noted: Homer's *Iliad* and *Odyssey;* Virgil's *Æneid;* the German *Nibelungenlied;* the Anglo-Saxon poem of *Beowulf;* the French *Song of Roland;* Dante's *Divina Commedia;* Tasso's *Gierusalemme Liberata;* Arisoto's *Orlando Furioso;* Milton's *Paradise Lost;* Spenser's *Fairy Queen;* Camoens' *Lusiad* (Portuguese); and Firdusi's *Shah Nameh* (Persian). Hesiod's *Theogony;* the poetic *Edda;* the Finnish *Kalewala;* the Indian *Mahâbhârata* may be described as collections of epic legends. The historical epic has an excellent representative in Barbour's *Bruce;* and specimens of the mock-heroic and humorous epic are found in *The Battle of the Frogs and Mice; Reynard the Fox;* Butler's *Hudibras;* and Pope's *Rape of the Lock.* Few efforts have been made to produce epics within the recent centuries and these few have had little success. The versified narrative has now been replaced with the prose story.

Epicharmus (ep-i-kär'mus), a Greek writer and philosopher of the Pythagorean school, born in the island of Cos about 540 B.C.; died in B.C. 450. He removed to Syracuse, where at the court of Hieron he spent the remainder of his life. He is credited with the invention of written comedy.

Epictetus (e-pik-tē'tus), a Greek Stoic philosopher, born in Phrygia about A.D. 60. He lived long at Rome, where, in his youth, he was a slave. Though nominally a Stoic, he was not interested in Stoicism as an intellectual system; he adopted its terminology and its moral doctrines, but in his discourses he appeared rather as a moral and religious teacher than as a philosopher. His doctrines approach more nearly to Christianity than those

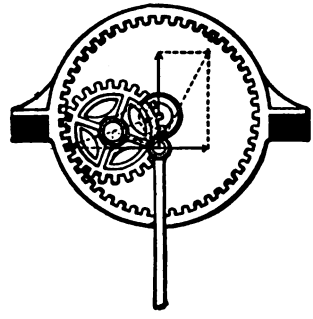
of any of the earlier Stoics, and although there is no trace in what is recorded of them of his having been directly acquainted with Christianity, it is at least probable that the ideas diffused by Christian teachers may have indirectly influenced them. The excellence of his system was universally acknowledged. When Domitian banished the philosophers from Rome (A.D. 94) Epictetus retired to Epirus, where he is supposed to have died. His disciple Arrian collected his opinions, which are preserved in two treatises called the *Discourses of Epictetus* and the *Manual* or *Enchiridion*.

Epicurus (ep-i-kū'rus), a Greek philosopher, founder of the Epicurean school, was born in the island of Samos in B.C. 342; died at Athens, in B.C. 270. He settled at Athens in B.C. 306, and purchased a garden in a favorable situation, where he established a philosophical school. Here he spent the remainder of his life, living in a simple manner and taking no part in public affairs. His pupils were numerous and enthusiastically devoted to him. His theory of the universe was based on the atomic theory of Democritus. The fundamental principal of his ethical system was that pleasure and pain are the chief good and evil, the attainment of the one and the avoidance of the other of which are to be regarded as the end of philosophy. He endeavored, however, to give a moral tendency to this doctrine. He exalted the pure and noble enjoyments derived from virtue, to which he attributed an imperishable existence, as incalculably superior to the passing pleasures which disturb the peace of mind, the highest good, and are therefore detrimental to happiness. Peace of mind, based on meditation, he considered as the origin of all good. The philosophy of Epicurus has been violently opposed and frequently misrepresented; but while it is not open to the charges of gross sensualism which have been brought against it, it cannot be considered as much better than a refinement of sensualism. In ancient times his philosophy appears to have been more popular in Greece than in Rome, although his disciples were numerous in both, and the Latin poem of Lucretius, *De Rerum Natura*, is a poetical exposition of his doctrines. Epicurus was a very voluminous writer, but few of his writings are extant, what we possess comprising only some fragments of a *Treatise on Nature*, two letters, and detached passages. Lucretius, Cicero, Pliny and Diogenes Laertius are our chief authorities for his doctrines.

Epicycle (ep'i-sī-kl), in the ancient astronomy, a small circle supposed to move round the circumference of a larger, a hypothetical mode of representing the apparent motion of the planets, which were supposed to have such a motion round the circumference of a large circle, called the *deferent*, having the earth in its center.

Epicycloid (ep-i-sī'kloid), in geometry, a curve generated by the movement of a circle upon the convex side of another curve, that generated by the movement of a circle upon the concave side of a fixed curve being called a *hypocycloid*.

Epicycloidal Wheel (ep-i-sī-kloi'dal wēl), a wheel or ring fixed to a framework, toothed on its inner side, and having in gear with it another toothed wheel of half the diameter of the first, fitted so as to revolve about the center of the latter. It is used for converting circular into



Epicycloidal Wheel.

alternate motion, or alternate into circular. While the revolution of the smaller wheel is taking place any point whatever on its circumference will describe a straight line, or will pass and repass through a diameter of the circle, once during each revolution. In practice, a piston-rod or other reciprocating part may be attached to any point on the circumference of the smaller wheel.

Epidamnus (ep-i-dam'nus). See *Durazzo*.

Epidaurus (ep-i-da'rus), a town and seaport of ancient Greece, situated in Argolis, in the Peloponnesus, particularly celebrated for its magnificent temple at Æsculapius, which stood on an eminence not far from the town. It had also temples of Artemis, Dionysus, Aphrodite and Hera, and a splendid theater still in fair preservation. The site is now occupied by the village *Epi-*

davro, where a congress met in 1822 and promulgated the 'Constitution of Epidaurus.'

Epidemic (ep-i-dem'ik), or EPIDEMIC DISEASE (Gr. *epi*, upon, and *demos*, people) signifies a disease which attacks a people, suddenly spreading from one to the other in all directions, prevailing a certain time and then dying away. It usually travels from place to place in the direction of the most frequented lines of communication. The reason is that such diseases are commonly due to some infective material capable of being conveyed from one individual to another, and of being transported from place to place. Among these diseases are smallpox, cholera, scarlet fever, measles, chicken-pox, diphtheria, typhoid fever, yellow fever, etc. Certain diseases which appear to be more mental than physical sometimes occur so numerously as to assume an epidemic form, such as St. Vitus' dance, convulsionary diseases, suicidal mania, etc. (See *Endemic.*)

Epidendrum (ep-i-den'drum; Gr. *epi*, upon, and *dendron*, a tree), a large genus of tropical American orchids, most of the species of which are epiphytic, growing on trees. There are upwards of 300 species. The stems are often pseudo-bulbs, the leaves are strap-shaped and leathery, and the flowers are single or in spikes, panicles or racemes. The flowers are very handsome, and a large number of the species are in cultivation.

Epidermis (ep-i-der'mis), in anatomy, the cuticle or scarf-skin of the body; a thin membrane covering the true skin of animals, consisting of two layers, an inner or mucous layer, called the *rete mucosum*, composed of active cells containing granules of coloring matter, and an outer or horny layer, consisting of flattened scale-like cells, dry, inactive and effete, which are constantly being shed in the form of dust. Both layers are destitute of feeling, and of vessels or nerves.—The term is also applied to the cellular layer which covers the surface of plants, usually formed of a layer or layers of more or less compressed and flattened cells. It may be thin and soft or dense and hard, and has often appendages in the form of hairs, glands, etc.

Epidote (ep'i-dōt), a mineral of a green or gray color, vitreous luster, and partial transparency, a member of the garnet family. The primary form of the crystals is a right rhomboidal prism.

Epigæa (ep-i-jē'a), a genus of shrubs of the heath order, characterized by having three leaflets on the outside of the five-parted calyx; and by the corolla being salver-shaped, five-cleft, with its tube hairy on the inside. *E. repens*, the trailing arbutus, is the May-flower of North America.

Epigastrium (ep-i-gas'tri-um), EPIGASTRIC REGION (Gr. *epi*, upon; *gastēr*, the stomach), that part of the abdomen that lies over the stomach. (See *Abdomen.*)

Epigenesis (ep-i-jen'e-sis), a technical term for the conception of the development of an organism by the division or segmentation of a simple germ or egg cell. It was preceded by the idea that a miniature copy of the organism existed in the germ and needed growth only.

Epiglottis (ep-i-glot'is), a cartilaginous plate behind the tongue, which covers the glottis like a lid during the act of swallowing, and thus prevents foreign bodies from entering the larynx. In its ordinary position during respiration it is pointed upwards, but in the act of swallowing it is pressed downwards and backwards by the drawing up of the windpipe beneath the base of the tongue, and thus closes the entrance to the air-passages. (See *Larynx.*)

Epigram (ep'i-gram; Gr. *epi*, upon; *graphein*, to write), in a restricted sense, a short poem or piece in verse, which has only one subject, and finishes by a witty or ingenious turn of thought; in a general sense, a pointed or witty and antithetical saying. The term was originally given by the Greeks to a poetical inscription placed upon a tomb or public monument, and was afterwards extended to every little piece of verse expressing with precision a delicate or ingenious thought, as the pieces in the Greek anthology. In Roman classical poetry the term was somewhat indiscriminately used, but the epigrams of Martial contain a great number with the modern epigrammatic character.

Epigynous (e-pij'i-nus), in botany, growing on the top of the ovary or appearing to do so; said of stamens and petals.

Epilepsy (ep'i-lep-si; Greek, *epilēpsia*, literally, a seizure), a nervous disease, the falling-sickness, so called because the patient falls suddenly to the ground. It depends on various causes, often exceedingly complicated and incapable of being removed; hence it is often an incurable periodical disease, appearing in single paroxysms. In its fully developed form, convulsions, attended by complete unconsciousness, form the prom-

inent feature. Among the different causes may be mentioned hereditary tendency, gastric disturbances, or some irritation within the skull itself, such as tumors, etc. It is, for the most part, preceded by a tingling sensation, creeping up from the foot or hand to the breast and head, or some other premonitory symptom such as spectral illusions, headache, giddiness, confusion of thought, sense of fear, etc.; but sometimes there are no precursive symptoms. During the paroxysm all that is to be attended to is to prevent the patient from injuring himself; and this is to be accomplished by raising the head gently and loosening all tight parts of the dress. It is advisable to protect the tongue from being bitten by introducing a piece of India rubber, cork or soft wood between the teeth.

Epilobium (ep-i-lō'bi-um), the willow herbs, a genus of plants, nat. order Onagraceæ. The species are herbs or undershrubs, with pink or purple, rarely yellow, flowers, solitary in the axils of the leaves or in terminal leafy spikes. The seeds are tipped with a pencil of silky hairs, and are contained in a long, four-celled capsule. There are more than fifty species scattered over the Arctic and temperate regions of the world, ten of them being natives of Britain.

Epilogue (ep'i-log; Greek *epi*, upon, and *logos*, word, speech), the closing speech or short poem addressed to the audience at the end of a play. The epilogue is the opposite of the *prologue*, or opening address.

Epimachus (e-pim'a-kus), a genus of slender-billed (tenuirostral) birds of the hoopoe family, resembling the birds of paradise in the exceeding luxuriance and brilliancy of their plumage.

Epimenides (ep-i-men'i-dez), an ancient Greek philosopher and poet, born in Crete in the seventh century before Christ. He was held for an infallible prophet, and by some is reckoned among the seven wise men, instead of Periander. He is supposed to be the prophet referred to by St. Paul in Titus, i, 12.

Epimetheus (ep-i-mē'thūs), in Greek mythology, the brother of Prometheus and husband of Pandora. Epimetheus may be translated 'afterthought,' as Prometheus 'forethought.'

Epinal (ā-pē-nal), a town of Eastern France, capital of the department of the Vosges, on the Moselle. It is well built and has handsome quays, an ancient Gothic church, a communal college, a public library, a museum, etc. The manufactures consist of articles in iron and brass, cutlery, earthenware, leather, oil and chemicals. The famous paper-mills of Archettes are in the vicinity. Pop. (1906) 21,296.

Epinay (ā-pē-nā), LOUISE FLORENCE PÉTRONILLE, MADAME D', a French authoress, born in 1725; died in 1783. She became the wife of M. Delalive d'Épinay. In 1748 she became acquainted with Rousseau, and gave him a cottage in which he passed much time. She left interesting memoirs.

Epiphanius (e-pi-fā'ni-us), ST., was born in Palestine about 130; died in 403. About 367 he was consecrated Bishop of Salamis or Constantia, in Cyprus. His work *Panarion* gives the history, together with the refutation, of a great number of heresies. His festival is on the 12th of May.

Epiphany (e-pif'e-ni; Greek, *epiphaneia*, a manifestation or showing forth), a festival, otherwise called the *manifestations of Christ to the Gentiles*, observed on the 6th of January in honor of the adoration of the three magi, or wisemen. As a separate festival it dates from 813.

Epiphyte (ep'i-fīt; Greek, *epi*, on; *phyton*, a plant), a plant which grows and flourishes on the trunks and branches of trees, adhering to the bark, as a moss, lichen, fern, etc., but which does not like a parasite derive any nourishment from the plant on which it grows. Many orchidaceous plants are epiphytes.

Epiphytic (ep'i-fit-ik), the term applied to the spread of contagious diseases among plants. Contagion is as common in the vegetable kingdom as in the animal (see *Epidemic*, *Epizoötic*) and is responsible for enormous losses of wealth. A well-known botanist has estimated that the annual loss of crops from plant diseases throughout the world varies from $750,000,000 to $1,000,000,000. The idea of an international fight against epiphytics was formulated for the first time in 1891, at the International Congress of Agriculture at the Hague. An international commission for studying plant maladies, formed at Rome in 1903, has its seat at Berlin.

Epirus (e-pī'rus; Greek, *Epeiros*), a country of ancient Greece corresponding to the southern portion of Albania. The inhabitants were only in part Greeks. Epirus became a Roman province in B.C. 168, and shared the fortunes of Rome till conquered by the Turks.

Episcopacy (e-pis'ku-pā-si), the system of church govern-

ment in which bishops are established as distinct from and superior to priests or presbyters, there being in the church three distinct orders—deacons, priests and bishops. See *Bishop*.

Episode (ep'i-sōd; Greek, *epeisodion*, something adventitious), an incidental narrative, or digression in a poem, which the poet has connected with the main plot, but which is not essential to it.

Epistaxis (e-pi-staks'is), in medicine, a name for bleeding from within the nose.

Epistemology (e-pis-te-mol'ō-ji; Greek, *epistēmē*, knowledge), that department of metaphysics which investigates and explains the doctrine or theory of knowing; distinguished from *ontology*, which investigates real existence or the theory of being.

Epistolæ Obscurorum Virorum ('Letters of Obscure Men') is the title of a collection of satirical letters which appeared in Germany in 1515-17, and professed to be the composition of certain ecclesiastics and professors in Cologne and other places. It is considered as one of the most masterly sarcasms in the history of literature, and its importance is enhanced by the effect it had in promoting the cause of the Reformation. The authorship of this satire has been a fertile subject of controversy, and is yet apparently far from being settled.

Epitaph (ep'i-taf; Greek, *epi*, upon, and *taphos*, tomb), an inscription upon a tomb or monument in honor or memory of the dead. Epitaphs were in use both among the Greeks and Romans. The Greeks distinguished by epitaphs only their illustrious men. Among the Romans they became a family institution, and private names were regularly recorded upon tombstones. The same practice has generally prevailed in Christian countries. On Christian tombstones epitaphs usually give brief facts of the deceased's life, sometimes also the pious hopes of survivors in reference to the resurrection or other doctrines of the Christian faith, etc. Many so-called epitaphs are mere witty *jeux d'esprit*, which might be described as epigrams, and which were never intended seriously for monumental inscriptions. The literature of the subject is very large.

Epithalamium (e-pi-tha-lā'mi-um; Gr. *epi*, on, and *thalamos*, a chamber, a nuptial song or poem in praise of a bride and bridegroom. Among the Greeks and Romans it was sung by young men and maids at the door of the bridal chamber of a new-married couple. Sappho, Anacreon, Pindar, Catullus and other Greek and Roman authors composed poems of this type. The finest example extant is Spenser's ardent *Epithalamion*.

Epithelioma (ep-i-the-li-ō'ma), epithelial cancer. See *Cancer*.

Epithelium (e-pi-the'li-um), in anatomy, the cellular layer which covers the body and the one which lines the internal cavities and canals of the body, as the mouth, nose, respiratory organs, alimentary canal, etc. There are several varieties of epithelium. The lining of the blood-vessels and all other closed cavities are called *endothelium*.

Epizoa (e-pi-zō'a), a term applied to those parasitic animals which live upon the bodies of other animals, as lice, the itch-insect, etc.

Epizoötic (e-pi-zō-ōt'ik), or EPIZOÖTIC DISEASE, a disease that at some particular time and place attacks great number of the lower animals just as an epidemic attacks man. Pleuropneumonia is often an epizoötic, as was also the rinderpest.

Epoch (ē'pok, ep'ok), or ERA, is a fixed point of time, commonly selected on account of some remarkable event by which it has been distinguished, and which is made the beginning or determining point of a particular year from which all other years, whether preceding or ensuing, are computed. The creation has formed the foundation of various chronologies, the chief of which are: 1. The epoch adopted by Bossuet, Ussher and other Catholic and Protestant divines, which places the creation in B.C. 4004. 2. The *Era of Constantinople* (adopted by Russia), which places it in B.C. 5508. 3. The *Era of Antioch*, used till A.D. 284, placed the creation B.C. 5502. 4. The *Era of Alexandria*, which made the creation B.C. 5492. This is also the *Abyssinian Era*. 5. The *Jewish Era*, which places the creation in B.C. 3760. The Greeks computed their time by periods of four years, called *Olympiads*, from the occurrence every fourth year of the Olympic games. The first Olympiad, being the year in which Coræbus was victor in the Olympic games, was in the year B.C. 776. The Romans dated from the supposed era of the foundation of their city (Ab Urbe Condita, A. U. C.), the 21st of April, in the third year of the sixth Olympiad, or B.C. 753 (according to some authorities, B.C. 752). The *Christian Era*, or mode of computing

from the birth of Christ as a starting-point, was first introduced in the sixth century, and was generally adopted by the year 1000. This event is believed to have taken place earlier, perhaps by four years, than the received date. The *Julian epoch*, based on the coincidence of the solar, lunar and indictional periods, is fixed at 4713 B.C., and is the only epoch established on an astronomical basis. The *Mohammedan Era*, or *Hejira*, commenced on July 16, 622, and the years are computed by lunar months. The Chinese reckon their time by cycles of 60 years. Instead of numbering them as we do, they give a different name to every year in the cycle. See *Chronology, Calendar.*

Epping (ep'ing), a village of England, in Essex, 17 miles from London, in the midst of an ancient royal forest which one time covered nearly the whole of Essex. The unenclosed portion has lately been secured by the public as a free place of recreation.

Eprouvette (ep-rö-vet'), the name of an instrument for ascertaining the strength of gunpowder, or for comparing the strength of different kinds of gunpowder.

Epsom (ep'som), a town in the county of Surrey, England, 15 miles S. W. of London, formerly celebrated for a mineral spring, from the water of which the well-known Epsom salts were manufactured. The principal attraction Epsom can now boast of is the grand race meeting held on the Downs, the chief races being the Derby and Oaks (which see). Pop. (1911) 19,156.

Epsom Salt, sulphate of magnesium ($MgSO_4.7H_2O$), a cathartic salt which appears in capillary fibers or acicular crystals. It is found covering crevices of rocks, in mineral springs, etc.; but is commonly prepared by artificial processes from magnesian limestone by treatng it with sulphuric acid, or by dissolving the mineral *kieserite* ($MgSO_4H_2O$) in boiling water, allowing the insoluble matter to settle, and crystallizing out the Epsom salt from the clear solution. It is employed in medicine as a purgative, and in the arts. The name is derived from its having been first procured from the mineral waters at Epsom.

Epworth (ep'wurth), a small town of N. Lincolnshire, 9 miles N. of Gainsborough, the birthplace of John Wesley, the founder of Methodism. Pop. 3746.

Epworth League, a society founded at Cleveland, Ohio, in 1889, among the young members of the Methodist Episcopal Church, as a successor to the Young Peoples' Methodist Alliance of 1883. Its purpose was 'to attain and help others to attain the highest New Testament standard of experience and life.' The society grew rapidly and has been of much service to the Church. It now claims to be the largest denominational society of young people in the world, having chapters in many foreign lands.

Equation (ē-kwā'shun), in algebra, a proposition asserting the equality of two quantities, and expressed by the sign = between them; or an expression of the same quantity in two dissimilar terms, but of equal value; as, $3s. = 36d.$ or $x = b + m - r$. In the latter case x is equal to b added to m, with r subtracted, and the quantities on the right hand of the sign of equation are said to be the value of x on the left hand. An equation is termed *simple, quadratic, cubic* or *biquadratic*, or of the first, second, third or fourth degree, according as the index of the highest power of the unknown quantity is one, two, three or four.

Equation, in astronomy, the correction or quantity to be added to or subtracted from the mean position of a heavenly body to obtain the true position. The term *personal equation* is the quantity of time by which a person is in the habit of noting a phenomenon wrongly; it may be called positive or negative, according as he notes it after or before it really takes place.

Equation of Payments, an arithmetical rule for the purpose of ascertaining at what time it is equitable that a person should make payment of a whole debt which is due in different parts, payable at different times.

Equation of Time, the difference between mean and apparent time, or the difference of time as given by a clock and as given by a sun-dial, arising chiefly from the varying velocity of the earth in its orbit and the eccentricity of the orbit. The sun and the clock agree four times in the year; the greatest difference between them at the beginning of November is fully sixteen minutes. See *Day.*

Equator (ē-kwā'tûr), that great circle of our globe every point of which is 90° from the poles. All places which are on it have invariably equal days and nights. Our earth is divided by it into the northern and southern hemispheres. From this circle is reckoned the latitude of places both north and south. There is also a correspond-

ing celestial equator in the plane of the terrestrial, an imaginary great circle in the heavens the plane of which is perpendicular to the axis of the earth. It is everywhere 90° distant from the celestial poles, which coincide with the extremities of the earth's axis, supposed to be projected to meet the heavens. During his apparent yearly course the sun is twice in the celestial, and vertically over the terrestrial equator, at the beginning of spring and of autumn. Then the day and night are equal all over the earth, whence the name *equinox*. —The *magnetic equator* is a line which pretty nearly coincides with the geographical equator, and at every point of which the vertical component of the earth's magnetic attraction is zero; that is to say, a dipping needle carried along the magnetic equator remains horizontal. It is hence also called the *aclinic line*.

Equatorial (ē-kwa-tō'ri-al), an astronomical instrument contrived for the purpose of directing a telescope upon any celestial object, and of keeping the object in view for any length of time, notwithstanding the diurnal motion of the earth. For these purposes a principal axis resting on firm supports is mounted exactly parallel to the axis of the earth's rotation, and consequently pointing to the poles of the heavens, being fixed so as to turn on pivots at its extremities. To this there is attached a telescope moving on an axis of its own in such a way that it may either be exactly parallel to the other axis, or at any angle to it; when at right angles it points to the celestial equator. By this means a star can be followed by one motion from its rising to its setting. In some observatories the equatorials have the necessary motion given them by clockwork.

Equerry (ek'we-ri, ē-kwe'ri), in Britain, the name of certain officers of the royal household, in the department of the master of the horse, whose duties consist in attendance when the sovereign rides abroad. Officers with the same denomination form part of the establishments of the members of the royal family.

Equestrian Order (e-kwes'tri-an), the order of 'Knights' existing in ancient Rome. The *equites* or knights originally formed the cavalry of the army. They are said by Livy to have been instituted by Romulus, who selected 300 of them from the three principal tribes. About the time of the Gracchi (123 B.C.) the equites became a distinct order in the state, and the judges and the farmers of the revenue were selected from their ranks. They held their position in virtue of a certain property qualification, and towards the end of the republic they possessed much influence in the state. They had particular seats assigned to them in the circus and theater, and the insignia of their rank, in addition to a horse, were a gold ring and a robe with a narrow purple border. Under the later emperors the order disappeared from the stage of political life.

Equidæ (ē'kwi-dē), the horse family, a family of animals belonging to the order Ungulata, or hoofed mammals, and subdivision Perissodactyla, characterized by an undivided hoof formed of the third toe and its enlarged horny nail, a simple stomach, a mane on the neck, and by six incisor teeth on each jaw, seven molars on either side of both jaws, and by two small canine teeth in the upper jaw of the males, and sometimes in both jaws. It is divided into two groups—one including the asses and zebras, the other comprising the true horses (genus *Equus*).

Equilibrium (e-kwi-lib'ri-um), a state of equipoise; a state of rest produced by the mutual counteraction of two or more forces, as the state of the two ends of a lever or balance, when both are charged with equal weight. When a body, being slightly moved out of any position, always tends to return to its position, that position is said to be one of *stable equilibrium*; when the body will not thus return to its previous position, its position is said to be one of *unstable equilibrium*.

Equinoctial (e-kwi-nok'shal), in astronomy, the circle in the heavens otherwise known as the celestial equator. When the sun is on the equator there is equal length of day and night over all the earth; hence the name *equinoctial*.—*Equinoctial gales*, storms which are observed generally to take place about the time of the sun's crossing the equator, that is, at the vernal and autumnal equinox, in March and September. (See *Equinox*.)—*Equinoctial points* are the two points wherein the celestial equator and ecliptic intersect each other; the one, being in the first point of Aries, is called the *vernal point*; and the other, in the first point of Libra, the *autumnal point*. These points are found to be moving backward or westward at the rate of 50″ of a degree in a year. This is called the precession of the equinoxes. See *Precession*.

Equinox (ē'kwi-noks), the precise time when the sun enters one of the equinoctial points, or the first

point of Aries about the 21st of March, and the first point of Libra about the 23d of September, making the day and night of equal length all over the world. At all other times the lengths of the day and the night are unequal, their difference being the greater the more we approach either pole, while in the same latitude it is everywhere the same. See *Equinoctial.*

Equisetum (e-kwi-sē'tum), a genus of ascular cryptogamous plants with hollow-jointed stems, type of a nat. order, the Equisetaceæ, growing in wet places, and popularly called *horse-tails.* See *Horse-tail.*

Equites (ek'wi-tēz). See *Equestrian Order.*

Equity (ek'wi-ti), in law, the system of supplemental law administered in certain courts, founded upon defined rules, recorded precedents, and established principles, the judges, however, liberally expounding and developing them to meet new exigencies. While it aims to assist the defects of the common law, by extending relief to those rights of property which the strict law does not recognize, and by giving more ample and distributive redress than the ordinary tribunals afford, equity by no means either controls, mitigates or supersedes the common law, but rather guides itself by its analogies, and does not assume any power to subvert its doctrines. Courts of equity grant redress to all parties where they have rights, *ex æquo et bono,* and modify and fashion that redress according to circumstances. They bring before them all the parties interested in the subject matter of the suit, and adjust the rights of all.

Equity of Redemption, in law, the advantage allowed to a mortgager of a reasonable time to redeem an estate mortgaged, when it is of greater value than the sum for which it is mortgaged.

Equivalents (e-kwiv'a-lents), in chemistry, a term for the proportions in which the elements combine with one another to form compounds. See *Chemistry.*

Era (ē'ra). See *Epoch.*

Era of Good Feeling, the period from 1817 to 1824 when the Democratic-Republican was virtually the only party in the United States. President Monroe was reëlected in 1821 by 231 electoral votes out of 232 and some writers restrict the term to his second administration. One elector voted against him on the plea that Washington's record of an unanimous election should not be equaled. Internal improvements and tariff questions broke up the harmony after 1824.

Erard (ā-rär), SEBASTIEN, a celebrated musical instrument maker, born at Strasburg in 1752; died in 1831. He went to Paris at the age of eighteen, and in concert with his brother, Jean Baptiste, produced pianofortes superior to any that had previously been made in France. He afterwards established a manufactory in London, and made considerable improvements in the mechanism of the harp.

Erasistratus (e-ra-sis't ra-tus), an ancient Greek physician, said to have been grandson of Aristotle. He lived in the third century before the Christian era, and was court physician of Seleucus Nicator, king of Syria. He was the first who systematically dissected the human body, and his description of the brain and nerves is much more exact than any given by his predecessors. He classified the nerves into nerves of sensation and of locomotion, and it is said had almost stumbled upon the discovery of the circulation of the blood. Of his works only the titles and some fragments remain.

Erasmus (e-ras'mus), DESIDERIUS, a Dutch scholar, born at Rotterdam in 1467. His original name was

Desiderius Erasmus.

Gerard, but this he changed according to a fashion of the time. After the death of his parents, whom he lost in his fourteenth year, his guardians compelled him to enter a monastery; and at the age of seventeen he assumed the

monastic habit. The Bishop of Cambray delivered him from this constraint. In 1492 he traveled to Paris to perfect himself in theology and polite literature. He there became the instructor of several rich Englishmen, from one of whom —Lord Mountjoy—he received a pension for life. He accompanied them to England in 1497, where he was graciously received by the king. He returned soon after to the continent, took his doctor's degree, was relieved from his monastic vows by dispensation from the pope, and published several of his works. He returned to England in 1510; wrote his *Praise of Folly* while residing with Sir Thomas More, and was appointed Margaret professor of divinity and Greek lecturer at Cambridge. In 1514 he returned to the continent and lived chiefly at Basel, where he died in 1536. To extensive learning Erasmus joined a refined taste and a delicate wit. He rendered great and lasting service to the cause of reviving scholarship. Although he took no direct part in the Reformation, and was reproached by Luther for lukewarmness, he attacked the supposed disorders of monasticism and superstition, and advocated a moderate course. He edited various classics, the first edition of the Greek Testament from MSS. (with Latin translation), etc., but his best-known books are the *Encomium Moriæ*, or *Praise of Folly*, and his *Colloquies*. His letters are very valuable in reference to the history of that period.

Erastianism (e-ras'ti-an-izm), the opinions of Erastus (which see).

Erastus (e-ras'tus), the learned name of Thomas Lieber, a Swiss physician, who maintained the opinions from which the well-known epithet of *Erastian*, as now used, is derived. He was born at Baden in 1523, and died at Basel in 1584. He was successively professor of medicine at Heidelberg, and of ethics at Basel. He maintained in his writings the complete subordination of the ecclesiastical to the secular power, declaring that the church had no right to exclude any one from church ordinances, or to inflict excommunication.

Erato (er'a-tō), in Greek mythology, one of the Muses, whose name signifies loving or lovely. She presided over lyric and especially amatory poetry, and is generally represented crowned with roses and myrtle, and with the lyre in the left hand and the plectrum in the right, in the act of playing.

Eratosthenes (e-ra-tos'the-nēz), an ancient Greek astronomer, born at Cyrene, in Africa, in B.C. 276; was librarian at Alexandria, and gained his greatest renown by his investigations of the size of the earth. He rendered much service to the science of astronomy, and first observed the obliquity of the ecliptic. Of the writings attributed to him, one only remains complete—*Katasterismoi*—which treats of the constellations. He died about B.C. 194.

Erbium (er'bi-um), a rare metal found along with yttrium, terbium, and other rare elements, in some rare minerals. Its properties are but little known.

Ercilla y Zuniga (er-thil'yä ē thō-nyē'gä), Don Alonso de, a Spanish soldier and poet, born in 1533; died in 1595. He became page to the Infant Don Philip, accompanied him on his travels, and in 1554 went with him to England on the occasion of his marriage with Queen Mary. After this he fought against the Araucanians of South America (Chile), and his epic *La Araucana* is based in the events of this war. It was first published in 1569, is written in excellent Spanish, and occupies an honorable position in the national literature.

Erckmann-Chatrian (erk-mon shât-ri-äṅ), the joint name of two French-Alsatian writers of fiction. Émile Erckmann, born at Pfalzburg in 1822, studied law at Paris. Alexander Chatrian, born at Soldatenthal, near Pfalzburg, 1826, was for some time teacher in the Pfalzburg College. They formed a literary partnership in 1847, but it was not till the appearance of *L'Illustre Docteur Mathéus*, in 1859, that success attended them. Among their most popular books are *L'Ami Fritz*, *Le Fou Yégof*, *Madame Thérèse*, *Histoire d'un Conscrit de 1813*, *L'Histoire d'un Paysan*, *Waterloo*, *Le Plébiscite*, etc. Chatrian died September 4, 1890, and Erckmann in 1899.

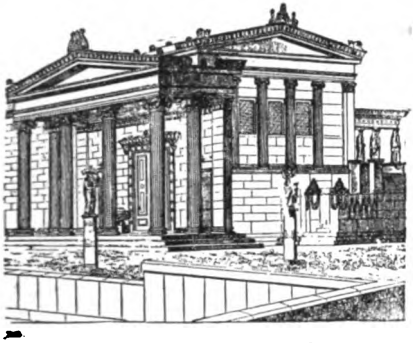
Erebus (er'e-bus), in the Greek mythology, the son of Chaos and Darkness. The name Erebus was also given to the infernal regions.

Erebus, Mount, a volcano of the Antarctic regions, in S. Victoria Land; height, 12,400 feet.

Erechtheus (e-rek'thŭs), in Greek mythology, a personage associated with the early history of Athens, and to whom a fine temple, the *Erechthēum*, was built on the Acropolis.

Eregli (er-e-gle'), Erekli, the ancient *Heracleia*, a seaport of Asia Minor, on the Black Sea, province of Kastamuni, 128 miles E. N. E. of Constantinople. Pop. 6000.

Eremite (er'e-mīt), a hermit or Anchorite. See *Anchorite.*



The Erechtheum (restored).

Erfurt (er'fört), an important town in the Prussian province of Saxony, on the river Gera, formerly a fortress with two citadels, now given up as such. It has a fine cathedral dating from the thirteenth century and several handsome Gothic churches. The university, founded in 1378 and suppressed in 1816, was long an important institution. There is still a royal academy of science and a royal library with 60,000 vols. The monastery (now an orphanage) was the residence of Luther from 1501 to 1508. The town is in a very flourishing condition, and rapidly extending. The industries are varied, including clothing, machinery, leather, shoes, ironmongery, chemicals, etc. The horticulture of the environs enjoys a high reputation, plants and seed being produced for sale in great quantities. Pop. (1910) 111,461.

Ergot (er'gut), the altered seed of rye and other grasses caused by the attack of a fungus called *Claviceps purpurea.* The seed is replaced by a dense, homogeneous tissue largely charged with an oily fluid. In its perfect state this germinates and produces the *Claviceps.* When diseased rye of this kind is eaten in food for some time it may cause death by a kind of mortification called dry gangrene. Ergot is used in obstetric practice to promote the contraction of the uterus after childbirth.

1, Heads of Ergot (*aa*) produced on a grass. 2, *Claviceps purpurea* (*bb*) springing from the Ergot.

Erica (e-rī'ka), the heath, a large genus of branched rigid shrubs, type of the nat. order Ericaceæ, most of which are natives of South Africa, a few being found in Europe and Asia. The leaves are narrow and rigid, the flowers are globose or tubular, and four-lobed. Five species are found in Britain. See *Heath.*

Ericaceæ (e-ri-kā'-se-ē), a nat. order of exogenous plants. See *Erica.*

Erica herbacea.

Ericht (er'-ikt), Loch, a Scottish loch amid the Grampian Mountains, on the borders of Perth and Inverness shires. It is 14½ miles long by about one mile broad, and joins Loch Rannoch by one outlet.

Ericson, Leif, or Leif the Lucky, a Norse explorer, who, about the year 1000 set out to find the country which had been previously sighted to the west, landed at several places, and wintered at one, which he called Vinland. (See *Vinland.*) The facts of this voyage are recorded in the Icelandic sagas.

Ericsson (er'iks-son), John, engineer, born in Sweden in 1803; died in 1889. He is identified with numerous inventions and improvements on steam machinery and its applications. His chief inventions are his caloric engine, the screw propeller and his turretships, the first of which, the *Monitor,* distinguished itself in the American Civil war, and inaugurated a new era in naval warfare. He also invented the steam fire-engine, a torpedo boat, and a solar engine.

Erie (ē'ri), one of the great chain of North American lakes, between Lakes Huron and Ontario, about 265 miles long, 63½ miles broad at its center, from 40 to 60 fathoms deep at the deepest part; area 9600 square miles. The whole of its southern shore is within the territory of the United States, and its northern within that of Canada. It receives the waters of the upper lakes by Detroit River at its southwestern extremity, and discharges its waters into Lake Ontario by the Niagara River at its northeast end. The Welland Canal enables vessels to pass from it to Lake Ontario. It is

shallow compared with the other lakes of the series and is subject to violent storms. The principal harbors are those on the United States side—Buffalo, Erie, Cleveland, etc.

Erie, county seat of Erie County, State of Pennsylvania, an important railway and lake commercial center on the southern shore of Lake Erie. Only port of Pennsylvania on the Great Lakes. There are many industries, including iron-works for boilers, engines and electrical machinery, with foundries, rolling-mills and blast furnaces, petroleum refineries, breweries, tanneries wood-working factories, brass, aluminum and sheet-metal plants, silk, woolen and paper mills. Presque Isle Bay with peninsula and adjoining parks, affords natural harbor and summer resort. There are extensive fresh water fisheries. Commerce exceeds $100,000,000 in value annually. The chief articles of export are coal, oil, iron and manufactured goods. Pop. 76,380.

Erie Canal, the largest canal in the United States, serving to connect the Great Lakes with the sea. It begins at Buffalo on Lake Erie, and extends to the Hudson at Albany. It is 363 miles long; has in all 72 locks; a surface width of 70 feet, bottom width of 42 feet, and depth of 7 feet. It is carried over several large streams on stone aqueducts; cost nearly $10,000,000, and was opened in 1825. The navigation is free. It is under contract to deepen and widen it, and thus adapt it to larger vessels. As thus dealt with it will be 125 feet wide at top, 75 feet at bottom, and 12 feet deep, cost exceeding $100,000,000.

Erigena (er-ij'i-na), JOANNES SCOTUS, an eminent scholar and metaphysician, probably born in Ireland about 800-810; died in France about 875. He spent a great part of his life at the court of Charles the Bald of France. His treatise on *Predestination and Free-will*, and another, *De Divisione Naturæ*, containing many unorthodox views, were condemned by the councils of Valencia in 855 and of Longres in 859, and Pope Nicholas I demanded the immediate disgrace of the culprit. His subsequent history is not known.

Erigeron (er-ij'ĕ-ron), a genus of humble composite plants, of which *E. Canadense* of America has diuretic properties.

Erinaceus (e-ri-nā'se-us), a genus of animals, of which the hedgehog is the type. See *Hedgehog.*

Erinna (e-rin'na), a Greek poetess who lives about 600 B.C. She is said to have been an intimate friend of Sappho, and died at the age of eighteen. She acquired a high reputation for poetry; her chief work was called *Elakatē* ('The Distaff'), of which nothing has come down to us. An epitaph or two which are still extant, and believed by some to be hers, are by others deemed spurious.

Erinnyes (e-rin'i-ēz). See *Furies.*

Eriodendron (er-i-ō-den'dron), the wool tree, a genus of plants, nat. order Malvaceæ (mallows). There are eight species natives of America, but one belongs to Asia and Africa. The species are noble plants, growing from 50 to 100 feet high, having palmate leaves, and red or white flowers. The wooly coat of the seeds of some of the species is used in different countries for stuffing cushions and similar purposes.

Wool Tree (*Eriodendron anfractuosum*).

Eriometer (er-i-om'e-tėr; Greek, *erion*, wool; *metron*, a measure), an optical instrument for measuring the diameters of minute particles and fibers, from the size of the colored rings produced by the diffraction of the light in which the objects are viewed.

Eriophorum (er-i-o f'o-r u m). See *Cotton-grass.*

Eris (e'ris), in the Greek mythology, the goddess of discord. Not being invited to the marriage of Peleus, she revenged herself by means of the *apple of discord.* See *Paris.*

Erith (er'ith), a town of England, in Kent, on the Thames, about 14 miles east of London, a pleasant summer resort. Pop. (1911) 27,755.

Erivan (er-ē-vän'), a Russian town, capital of a government of the same name in the lieutenancy of the Caucasus, on the Zanga, north of Mount Ararat. It has a citadel, barracks, a cannon foundry and some manufactures. Pop. 29,033. The GOVERNMENT has an area of 10,705 sq. miles, and a pop. of 909,100.

Erlangen (er'läng-en), a town of Bavaria, 10 miles N. N. W. of Nürnberg. The Protestant university, founded in 1743, is the chief institution. The industries include cotton-spinning and weaving, mirrors, hosiery, gloves, combs, etc. Pop. (1905) 23,720.

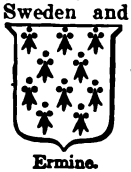
Erlau (er'lou), or EGER, a town of Hungary, on the Eger, 65 miles E. N. E. of Budapest. It has sundry manufactures; and the red wines of the district, esteemed the best in Hungary, are largely exported. Pop. 24,650.

Erl-king, the English form of the name given in German and Scandinavian poetical mythology to a personified natural power which devises and works mischief, especially to children. Goethe's celebrated poem *Der Erlkönig* (lit. 'elf-king') has rendered this malicious spirit universally known.

Ermine (er'min), the stoat, a quadruped of the weasel tribe (*Mustēla Erminĕa*), found over temperate Europe and N. America, but common only in the north. In consequence of the change that occurs in the color of

Ermine (*Mustēla Erminĕa*).

its fur at different seasons—by far most marked in the Arctic regions—it is not generally known that the ermine and stoat are the same. In winter, in cold countries or severe seasons, the fur changes from a reddish-brown to a yellowish-white, or almost pure white, under which shade the animal is recognized as the ermine. In both states the tip of the tail is black. Like many other species of this genus the ermine has the faculty of ejecting a fluid of a musky odor. Its fur is short, soft and silky; the best skins being brought from Russia Sweden and Norway and Hudson Bay territories. Its fur was formerly one of the insignia of royalty, and is still used by judges. When used as linings of cloaks the black tuft from the tail is sewed to the skin at irregular distances.—In heraldry, ermine is one of the furs, represented with its peculiar black spots on a white ground.



Ermine.

Erne (ėrn), the name often given to all the eagles of the genus *Haliaëtus*, but more specifically to the white-tailed sea eagle. See *Sea Eagle*.

Erne (ern), LOUGH, a lake of Ireland, County Fermanagh, consisting of a north or lower, and a south or upper lake (with the town of Enniskillen between), connected by a narrow winding channel, and properly forming only expansions of the river Erne. Its entire length is about 40 miles; average breadth 6 miles. It contains numerous small islands, and is well stocked with fish.—The River Erne rises in Lough Gounagh, in the County of Longford, flows through Loughs Oughter and Erne and falls into Donegal Bay below Ballyshannon. It is 72 miles long.

Ernest Augustus (ern'est a'gustus), King of Hanover and Duke of Cumberland, was the fifth son of George III; born in 1771; died in 1851. He became a field marshal in the British army, and on the death of William IV, in 1837, he ascended the throne of Hanover, in consequence of the succession to the sovereignty of that country being limited to male heirs. He was succeeded by his son, George V, the last of the Hanoverian kings.

Eros (ē'ros), the Greek name of Cupid and Amor. This name has also been given to a recently discovered planetoid, which is remarkable from the fact that its orbit, in its nearest approach to the earth, comes within that of Mars. It is thus the nearest to the earth of all celestial bodies except the moon. This fact renders it of great value in the study of the solar parallax, and it has been used for this purpose.

Erosion Theory (e-rō'zhun), in geology, the theory, now held by all geologists, that valleys are due to the wearing influences of water and ice, the latter chiefly in the form of glaciers, as opposed to the theory which regards them as the result of fissures in earth's crust produced by strains during it upheavel.

Erotic (e-rot'ik; from the Gr. *erōs*, love), relating to love.—*Erotic Poetry*, amatory poetry.—The name of *erotic* writers has been applied, in Greek literature, particularly to a class of romance writers, and to the writer of the *Milesian Tales*.

Erotomania (er-ō-to-mā'ni-a), mental alienation or melancholy caused by love.

Errata (e-ra'ta; Lat. the plural form of *erratum*, an error), the list of errors and corrections placed at the end or at the beginning of a book.

Erratics (e-rat'iks), or ERRATIC BLOCKS, in geology, boulders or large masses of angular rock which have been transported to a distance from their original mountains by the action of ice during the glacial period. Thus, on

the slopes of the Jura Mountains immense blocks of granite are found which have traveled 60 miles from their original situation. Similarly masses of Scotch and Lake district granites and of Welsh rocks (some of which weigh several tons) occur not uncommonly in the surface soil of the Midland counties of England.

Ersch (ersh), JOHN SAMUEL, a German bibliographer, born in 1766; died in 1828. He was principal librarian and professor of geography and statistics at Halle. Among his publications are a *Dictionary of French Writers;* a *Manual of German Literature;* and, in connection with Gruber, the *Universal Encyclopedia of Arts and Sciences* (Leipzig, 1818, et seq., 4to).

Erse (ers), a name sometimes given to Gaelic.

Erskine (ers'kin), EBENEZER, the founder of the Secession Church in Scotland, born in 1680; died in 1756. He studied at Edinburgh, and was ordained minister of Portmoak, in Fife, in 1703, in which situation he continued for twenty-eight years, when he removed to Stirling. His attitude towards patronage and other abuses in the church led to his being deposed, when, in conjunction with his brother and others, he founded the Secession Church. He is the author of several volumes of sermons.

Erskine, HENRY, a Scottish barrister, was the third son of Henry David, tenth earl of Buchan; born at Edinburgh in 1746; died in 1817. After studying at the universities of St. Andrews, Edinburgh and Glasgow, he adopted the legal profession, and in 1768 was called to the bar. He twice held the office of lord-advocate, was for long the leader of the Scottish bar, and held a high reputation as a wit.

Erskine, JOHN, of Carnock, afterwards of Cardross, Scottish jurist, born in 1695; died in 1768. He was called to the Scotch bar in 1719, and was author of *Principles of the Law of Scotland* and the *Institute of the Law of Scotland*, both works of authority.

Erskine, RALPH, brother of Ebenezer Erskine, born in 1685; died in 1752. He was ordained to the parish of Dunfermline in 1711, and in 1737 joined his brother, who had seceded from the Established Church. His *Gospel Sonnets* and other religious works were once very popular.

Erskine, THOMAS, LORD ERSKINE, a Scottish lawyer, the youngest son of the tenth Earl of Buchan, was born in 1750, and died in 1823. He was educated partly at the High School of Edinburgh, and partly at the University of St. Andrews. After serving four years in the navy and seven in the army he commenced the study of law, and in 1778 took his degree at Cambridge and was called to the bar. His success was immediate. In May, 1783, he received a silk gown and the same year was elected member of parliament for Portsmouth, a seat which he held till 1806, when he was raised to the peerage. The rights of juries he firmly maintained on all occasions, but particularly in the celebrated trial of the Dean of St. Asaph for libel. In 1789 he defended Mr. Stockdale, a bookseller, for publishing what was charged as a libelous pamphlet in favor of Warren Hastings. In 1792, being employed to defend Thomas Paine, when prosecuted for the second part of his *Rights of Man*, he declared that, waiving all personal convictions, he deemed it right, as an English advocate, to obey the call, by the maintenance of which principle he lost his office of attorney-general to the Prince of Wales. In the trials of Hardy, Tooke and others for high treason in 1794, which lasted for several weeks, the ability displayed by Erskine was acknowledged by all parties. He was a warm partisan of Fox, and a strenuous opposer of the war with France. In 1802 the Prince of Wales not only restored him to his office of attorney-general, but made him keeper of his seals for the Duchy of Cornwall. On the death of Pitt, in 1806, Erskine was created a peer, and raised to the dignity of lord-chancellor. During his short tenure of office the bill for the abolition of slavery was passed. After he retired with the usual pension he took little part in politics.

Eruptive Rocks (e-rup'tiv), in geology, those which, like lava, basalt, granite, etc., have broken through other rocks while in a molten state.

Eryngo (er-in'gō; *Eryngium*), a genus of plants belonging to the nat. order Umbelliferæ. There are upwards of 100 species found in temperate and subtropical climates, but chiefly in South America. *E. maritimum*, also called sea-holly, is a British species. It frequents sandy shores, and is distinguished by its rigid, spiny, glaucous, veined leaves, and its dense heads of blue flowers. The roots are sometimes candied, and are reputed to be stimulating and restorative, as well as to have aphrodisiac properties. *E. campestre* was formerly much employed in Europe as a tonic, and as tending to promote appetite.

E. aquaticum is an American species known by the name of rattlesnake weed.

Erysimum (e-r-i-s'-i-mum), a genus of plants nat. order Cruciferæ, chiefly biennials, with narrow entire leaves, and yellow, often fragrant, flowers. There are about 100 species, natives of northern temperate and cold countries. *E. cheiranthoides*, a native of Europe and North America, is found in waste places, and from being used as an anthelmintic, is called wormseed.

Erysipelas (er-i-sip'e-lus), the rose, or St. Anthony's fire, a disease characterized by diffused inflammation of the skin of some part of the body, but chiefly of the face or head, and attended by fever. It is, generally, an acute affection, its medium duration being from ten to fourteen days. It should be treated by nourishing food and iron tonics, the parts being protected from cold.

Erythema (er-i-thē'ma), a mild form of inflammation of the skin somewhat resembling erysipelas. Some forms are connected with constitutional diseases, as rheumatism, gout, etc.

Erythræa (er-i-thrē'a), a genus of annual herbs, of which *Centaury* is the best-known species.

Erythræa Sea (e-r-i-thrē'an), in ancient geography a name given to what is now called the Indian Ocean, but including the Persian and Arabian gulfs. The name was latterly restricted to the Arabian Gulf.

Erythrina (er-i-thrī'na), the coral tree, a genus of trees with bright red flowers. See *Coral Tree*.

Erythronium (e-r-i-thrō'ni-um), a genus of liliaceous plants, natives of temperate regions, nearly stemless herbs, with two smooth, shining, flat leaves, and large generally reddish flowers, which are solitary. They have a long, narrow, solid, scaly bulb. One of them is the dog's-tooth violet.

Erythrophlœum (er-i-thro-flē'um), a genus of tropical trees, nat. order Leguminosæ, containing three species, two found in Africa and the third in Australia. The *E. guineënse* of Guinea has a poisonous juice, which is used by the natives as a test of innocence and guilt, and hence the name ordeal tree.

Erythroxyleæ (er-i-throks-i'le-ē), Erythroxylaceæ, a nat. order of exogenous plants, having alternate stipulate leaves; small, pallid flowers and drupaceous fruit. The principal genus is *Erythroxylon*, some of whose species have a bright red wood (hence the name—Gr. *erythros*, red, *xylon*, wood), occasionally used for dyeing. For *E. coca* see *Coca*.

Eryx (er'iks), an ancient city and a mountain in the west of Sicily, about 2 miles from the sea-coast. The mountain, now Monte San Giuliano, rises direct from the plain to a height of 2184 feet. On the summit anciently stood a celebrated temple of Venus. All traces of the ancient town of Eryx have now disappeared, and its site is occupied by the modern town of San Giuliano.

Erzerum, Erzeroum or Erzeroom (er'ze-röm), a city of Turkish Armenia, capital of a vilayet with an area of 27,000 sq. miles, and a pop. of 582,745. The town is about 6000 feet above sea-level, forms an important strategical center, and has become a principal frontier fortress. It is irregularly built, its narrow, dirty streets, flanked by mean houses, being crowded together in the small space enclosed by its lofty walls. The Moslem element prevails largely over the Christian, although it is the metropolis of the Armenian Church in union with Rome. In addition to important manufactures, especially in copper and iron, it carries on an extensive trade, and is a chief halting-place for Persian pilgrims on their way to Mecca. Pop. about 43,000.

Erzgebirge (erts'ge-bir-ge; 'Ore Mountains'), a chain of European mountains forming a natural boundary between Saxony and Bohemia, nearly 120 miles in length and 25 miles broad. The highest summits, which are on the side of Saxony, rise to 3800 or 3900 feet. The mountains are rich in silver, iron, copper, lead, cobalt, arsenic, etc.

Esarhaddon (es-ar-had'on), the son of Sennacherib, and one of the most powerful of all the Assyrian monarchs. He extended the empire on all sides, and is the only Assyrian monarch who actually reigned at Babylon. He died about 667 B.C. See *Assyria*.

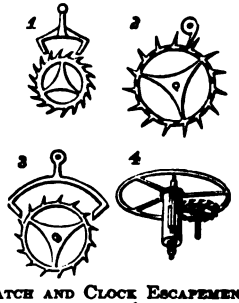
Esau (ē'sa), the eldest son of Isaac, and twin-brother of Jacob. His name (which signifies rough, hairy) was due to his singular appearance at birth, being 'red, and all over like a hairy garment.' The story of his marriage, of his loss of birthright through the craft of Rebekah and Jacob, and of his quarrel and reconciliation with Jacob are told in the book of Genesis. He was the progenitor of the Edomites, who dwelt on Mount Seir.

Escalator (es-ka-lā'tor), a moving stairway or traveling sidewalk. These are moving platforms to carry passengers from one point to an-

other, or steps to carry from one story to another. They were first tried at the Chicago Exposition of 1893, and soon became common.

Escanaba (es-ka-nȧ'ba), a city, capital of Delta Co., Michigan, at the north end of Green Bay; has a good harbor, shipping large amounts of iron ore. Has manufactures of lumber and wooden ware, veneer plants, furnace and tannery. Pop. 15,000.

Escapement (es-kāp'ment), the general contrivance in a time-piece by which the pressure of the wheels (which move always in one direction) and the vibratory motion of the pendulum or balance-wheel are accommodated the one to the other. By this contrivance the wheelwork is made to communicate an impulse to the regulating power (which in a clock is the pendulum and in a watch the balance-wheel), so as



WATCH AND CLOCK ESCAPEMENTS.
1, Anchor escapement of a common clock. 2, Duplex escapement. 3, Lever escapement. 4, Horizontal or cylinder escapement.

to restore to it the small portion of force which it loses in every vibration, in consequence of friction and the resistance of the air. The leading requisite of a good escapement is that the impulse communicated to the pendulum or balance-wheel shall be invariable, notwithstanding any irregularity or foulness in the train of wheels. Various kinds of escapements have been contrived, some of which are shown in the accompanying figure. See also *Clock*, *Watch*.

Escar, ESKAR (es'kar), a late geological formation in the superficial drift, generally consisting of a long, linear ridge of sand and gravel, including pieces of considerable size. The materials are derived from the waste of till or boulder-clay, and their arrangement took place probably under water over which icebergs floated, for in Sweden particularly angular, erratic blocks are often deposited on the *escar*. They are called in Scotland *Kaims* or *Kames*.

Escarp (e s-kȧ r p'), in fortification. See *Scarp*.

Eschalot (esh'a-lot). See *Shallot*.

Eschar (es'kȧr), a slough or portion of dead or disorganized tissue. The name is commonly applied to the crust or seal occasioned on the skin by burns or caustic applications.

Escharotics (es-ka-rot'iks), substances that cause an eschar (which see).

Eschatology (es-ka-tol'o-ji), in theology the 'doctrine respecting the last things,' which treats of the millennium, the second advent of Christ, the resurrection, judgment, conflagration of the world, and the final state of the dead.

Escheat (es-chēt'), in law, a species of reversion arising from default of heirs or by forfeiture. That which falls or lapses to the original proprietor, or to the State, as lands or other property. By modern legislation there can be no escheat or failure of the whole blood wherever there are persons of the half-blood capable of inheriting.

Eschenbach (esh'en-bȧȧ), WOLFRAM VON, a German mediæval poet or minnesinger, who flourished in the first half of the thirteenth century. The most esteemed of his numerous works are: *The Parzival* (printed in 1477); the *Titurel*, or the *Guardian of the Graal* (printed 1477); and the *Willehalm*, a poem on the deeds of William of Orange, a contemporary of Charlemagne.

Eschscholtzia (esh-sholt'si-a), a small genus of glabrous whitish plants, of the poppy order, natives of California and the neighboring regions. They have divided leaves and yellow, peduncled flowers. The sepals cohere and fall off as the flower opens in the form of a calyptra.

Eschwege (e s h' v ā-g e), a town of Prussia, province of Hessen-Nassau, on the Werra, 26 miles E. S. E. of Cassel. Pop. (1905) 11,113.

Eschweiler (esh'vī-lėr), a town of Prussia, in the province of Rheinland, 9 miles E. N. E. of Aix-la-Chapelle, on the Inde. It is the seat of large and varied manufacturing industries, especially in iron, copper and zinc, and has coal mines. Pop. 20,643.

Escobar y Mendoza (es-ko-b ä r' ē men-dō'th ȧ), ANTONIA, a Spanish casuist and Jesuit, born in 1589; died in 1669. His principal

works are *Summula Casuum Conscientiæ* and several scriptural commentaries. He was severely criticised by Pascal, and the extreme laxity of his moral principles was ridiculed by Boileau, Molière and La Fontaine.

Escrow (es-krō'), a legal writing delivered to a third person to be delivered by him to the person whom it purports to benefit, when some condition is performed. Upon the performance of this condition it becomes an absolute deed, but if the condition be not performed it remains an *escrow* or scroll.

Escurial (es-kū'ri-al; Spanish, *el Escorial*), a remarkable building in Spain, comprising at once a palace, a convent, a church and a mausoleum. It is distant from Madrid about 24 miles in a northwesterly direction, and situated on the acclivity of the Sierra Guadarrama, the range of mountains which divides New from Old Castile. It was built by Philip II, and dedicated to St. Lawrence, in commemoration of the victory of St. Quentin, fought on the festival of the saint in 1557. It is popularly considered to be built on the plan of a gridiron, from the fact that St. Lawrence is said to have been broiled alive on a sort of large gridiron. The building is a rectangular parallelogram measuring 744 feet in length by 580 in breadth. The interior is divided into courts, formerly inhabited by monks and ecclesiastics, while a projection 460 feet in length (the handle of the gridiron) contains the royal palace. It was begun in 1563 and finished in 1584. It is of moderate height, and its innumerable windows (said to be 11,000) give it (apart from the church) somewhat the aspect of a large mill or barracks. The church is the finest portion of the whole building. The dome is 60 feet in diameter, and its height at the center is about 320 feet. Under it is the pantheon or family vault of the Spanish sovereigns. The library contains a valuable collection, including a rich store of Arabic MSS. The Escurial was partly burned in 1671, when many MSS. were destroyed, and was pillaged by the French in 1808 and 1813. It was restored by Ferdinand VII, but the monks, with their revenues which supported it, have long since disappeared. In 1872 it was fired by lightning, and suffered serious damage.

Escutcheon (es-kuch'un), in heraldry, the shield whereon coats of arms are represented. See *Heraldry*.

Esdraëlon (es-dra-ē'lon), PLAIN OF, a plain extending across Palestine from the Mediterranean to the Jordan, and drained by the river Kishon. Among its subsidiary valleys are those of Engannin, Taanach and Megiddo. This plain is celebrated for many important events in Old Testament history.

Esdras (es'dras), BOOKS OF, two apocryphal books, which, in the Vulgate and other editions, are incorporated with the canonical books of Scripture. In the Vulgate the canonical books of Ezra and Nehemiah are called the first and second, and the apocryphal books the third and fourth books of Esdras. The Geneva Bible (1560) first adopted the present nomenclature, calling the two apocryphal books first and second Esdras. The subject of the first book of Esdras is the same as that of Ezra and Nehemiah, and in general it appears to be copied from the canonical Scriptures. The second book of Esdras is supposed to have been either of much later date or to have been interpolated by Christian writers.

Esk (Celtic for water), the name of two small rivers in England—one in Cumberland and one in Yorkshire; and of several in Scotland, the chief being the Esk in Dumfriesshire; the North Esk and South Esk in Forfarshire; and the North Esk and South Esk in Edinburghshire.

Es'kar. See *Escar*.

Eski-jumna (es'kē-jum'na), a town of Bulgaria, on the northern slope of the Binar-Dagh. Pop. 8942.

Eskilstuna (ā'skil-stū-na), a town of Sweden, on river of same name connecting Lake Maelar with Lake Hjelmar, with ironworks and manufactures of steel goods, weapons, etc. Pop. 13,663.

Eskimos (es'ki-mōz). See *Esquimaux*.

Eski-Sagra (es'kē-sa'gra), a town of Eastern Roumelia, on the south slope of the Balkans, 50 miles N. E. of Philippopolis. It has in its vicinity extensive gardens of roses, numerous orchards and mineral springs. Pop. 19,428.

Eski-Shehr (es'ke-she'hr), a town of Asiatic Turkey, 90 miles S. E. of the Sea of Marmora, with warm baths and manufactures of meerschaum pipes from the deposits of that substance in the neighborhood. Pop. about 20,000.

Esmarch (es'märh), JOHANNES FRIEDRICH AUGUST, a German surgeon; born in 1823; died in 1908. He held high official positions during the Schleswig-Holstein and Franco-German wars; was a great authority on gunshot wounds; originated valuable improvements

in barrack-hospitals, ambulances, etc.; and was the author of several surgical works.

Esneh (es'ne), a town of Upper Egypt, on the left bank of the Nile, 28 miles S. S. W. of Thebes, capital of a province of same name, on the site of the ancient Latopolis. Among the ruins there is a beautiful portico of twenty-four lofty and massive columns, belonging to a temple of Kneph (the only portion of the temple cleared out), and erected in the Ptolemaic and Roman period, with a zodiac on the ceiling. Esneh is the entrepôt of the Senaar caravans; has manufactures of cottons, pottery, etc.; and is reckoned the healthiest place in Egypt. Pop. 16,000.

Esocidæ (es-ok'i-dē), the family of fishes to which the true pike (*Esox lucius*) belongs, as also the mascalonge (*E. nobilior*) of America.

Esop (ē'sop). See *Æsop*.

Espalier (es-pal'yėr), in gardening, a sort of trellis-work on which the branches of fruit trees or bushes are extended horizontally, with the object of securing for the plant a freer circulation of air as well as a full exposure to the sun. Trees thus trained are not subjected to such marked nor so rapid variations of temperature as wall trees.

Esperanto (es-per-an'tō), an artificial international language invented by Dr. Zamenhof, of Warsaw.

Espionage Act. The espionage bill became a law with its approval by President Wilson on June 15, 1917. As enacted into law the bill does not carry the press censorship clause, which was the chief subject of debate. A summary of the bill follows:

Section (1) describes what constitutes the various forms of espionage and provides penalties, (2) gives the government power in times of national emergency over the vessels in ports of the United States, (3) provides penalties for those injuring vessels engaged in foreign commerce, (4) provides penalties for those interfering with the exportation of articles from the United States by violent means, (5) empowers the President to take steps toward the enforcement of neutrality, (6) gives the government authority to seize arms or other articles intended for export in violation of law, (7) clothes the President with power to forbid the export of such articles as he sees fit and provides penalties for those seeking to evade the embargo, (8) provides penalties for those guilty of acts tending to disturb foreign relations, (9) fixes regulations with regard to passports and provides penalties for violation of regulations, (10) provides penalties for counterfeiting or tampering with official documents, (11) authorizes the issuance of search warrants under special circumstances and fixes penalties for interference with officers of the government, (12) forbids the use of the mails for forwarding treasonable matter and fixes penalties, (13) extends the provisions of the bill to the Canal Zone and the insular possessions of the United States.

Espirito Santo (es-pē're-tō sän'tō; 'Holy Spirit'), a maritime province of Brazil, bounded north by Bahia, south by Rio de Janeiro; length, about 260 miles; breadth, about 120 miles; area, 17,316 square miles. Pop. 209,783.

Espiritu Santo (es-pē're-tō sän'tō), an island of the Pacific, the largest of the New Hebrides, with some 15,000 inhabitants.

Esplanade (es-plan-ād'), in fortification, the wide open space left between a citadel and the nearest houses of the city. The term is also frequently applied to a kind of terrace, especially along the seaside, for public walks or drives.

Esquimault (es-kē'mält), a harbor and naval station on the southeast coast of Vancouver Island, about 3 miles from Victoria, the capital of British Columbia. The harbor is almost landlocked, and with the 'Royal Roads' outside, is capable of giving safe anchorage to a fleet of vessels of the largest size. It is the station of British naval ships on the Pacific coast, and is being fortified and provided with all the necessaries of a first-class naval arsenal.

Esquimaux (es'ki-mōz), or ESKIMOS, (as the name is now more generally spelled), a race inhabiting the Arctic coasts of North America, from Greenland to Bering Strait, and extending into Asia. They call themselves *Inu-it*, the people; their other name is from an Algonquin word signifying eaters of raw flesh. They consist of three principal stocks—the Greenlanders; the Esquimaux proper, in Labrador; and the Western Esquimaux, found along Hudson Bay, the west side of Baffin Bay, the polar shores as far as the mouths of the Coppermine and Mackenzie rivers, and both on the American and Asiatic sides of Bering Strait. Their leading physical peculiarities are a stunted stature, flattened nose, projecting cheek-bones, eyes often oblique and yellow and brownish skin. Sealskins, reindeer and other furs are used as materials for dress, according to the season, as well as skins of otters, foxes, martens, etc.

In summer they live in tents, covered with skins; in winter they may be said to burrow beneath the snow. In Greenland houses built of stone and cemented with turf are used as permanent habitations, and houses made of slabs of frozen snow for use when traveling or hunting. Vegetation being extremely stunted within the limits of their territories, their food consists of the flesh of whales, seals, walrus, etc., often eaten raw; and they show remarkable skill in fishing and hunting. Their weapons are bows and arrows, spears or lances, generally pointed with bone, but sometimes with metal. Their only domestic animal is the Esquimaux dog (which see). In intellect they are by no means deficient; in manners they are kind and hospitable. Their religious ideas appear scanty, but success has attended the labors of the Danish missionaries in teaching them the Christian religion.

Esquimaux Dog, or ESKIMO DOG, a breed of dogs extensively spread over the northern regions of America and of Eastern Asia. It is rather larger than the English pointer, but appears smaller on account of the shortness of its legs. It has oblique eyes, an elongated muzzle, and a bushy tail, which give it a wolfish appearance, and it is wild and wolfish in its habits. The color is generally a deep dun, obscurely barred and patched with darker color. It is the only beast of burden in these latitudes, and with a team of such dogs attached to his sledge the Esquimaux will cover 60 miles a day for several successive days.

Esquire (e s' k w ī r; old Fr. *escuyer*, from L. *scutum*, a shield), originally, a shield-bearer or armor-bearer; an attendant on a knight; hence in modern times a title of dignity next in degree below a knight. In England this title is properly given to the younger sons of noblemen, to officers of the king's courts and of the household, to counselors at law, justices of the peace while in commission, sheriffs, gentlemen who have held commissions in the army and navy, etc. It is usually given to all professional and literary men, and, nowadays, in the addresses of letters, *esquire* may be put as a complimentary adjunct to almost any person's name. In heraldry the helmet of an esquire is represented sideways, with the vizor closed.

Esquiros (es-kē-ros), HENRI ALPHONSE, a French poet romancist, and miscellaneous writer, born at Paris in 1814; died at Versailles in 1876. His first work, a volume of poetry, *Les Hirondelles*, appeared in 1834. This was followed by numerous romances, and a commentary on the life of Christ, *L'Evangile du Peuple*, for which he was prosecuted and imprisoned. He then published *Les Chants d'un Prisonnier*, poems written in prison; *Les Vierges Folles; Les Vierges Sages; L'Histoire des Montagnards;* etc. Having to leave France in 1851, he resided for years in England, and wrote a series of essays for the *Revue des Deux Mondes* on English life and character, which were translated under the title of *The English at Home*, and were very popular. He also wrote a similar work on the Dutch.

Essay (es'ā), a composition in which something is attempted to be proved or illustrated, usually shorter and less methodical and finished than a systematic or formal treatise; so that it may be a short disquisition on a subject of taste, philosophy or common life. Caution or modesty has induced many writers of note to give the title of essay to their most elaborate productions; thus we have Locke's *Essay on the Human Understanding*. There is a class of English writers to whom the descriptive term *essayist* is applied. *The Spectator*, *The Tatler*, *The Rambler*, and many other extensive collections of brief treatises embracing every variety of subjects are among the works of this class of writers.

Essek (es'ek). See *Eszek*.

Essen (es'en), a town of Rhenish Prussia, 18 miles northeast of Düsseldorf, founded in the ninth century, and adorned with a fine church dating from 873. It has recently increased with great rapidity, and is celebrated for the steel and iron works of Krupp, the most extensive in Europe, employing about 40,000 workmen. This great establishment was started in 1827, with only two workmen. The works occupy 1000 acres, and the firm possesses coal and iron-stone mines. The rifled steel cannon made here are supplied to most of the armies of Europe. In the Krupp works there is now a steam-hammer of 150 tons. Pop. in 1910, including Altendorf, incorporated with it in 1900, 294,629.

Essence (es'ens), a solution of volatile or essential oils in spirits. See *Essential Oils*.

Essenes (es-sēnz'), or ESSÆANS, a sect among the Jews, the origin of which is unknown, as well as the etymology of their name. It appears to have sprung up in the course of the century preceding the Christian era, and

disappeared on the dispersion of the Jews after the siege of Jerusalem. The sect appears to have been an outcome of Jewish mysticism and asceticism, which gradually assumed the form of a distinct organization. Its members were remarkable for their strictness and abstinence and had a rule of life analogous to that of a monastic order. Their doctrines had an interesting resemblance to several of those of the Christian dispensation.

Essential Oils (e-sen'shal), volatile oils usually drawn from aromatic plants by subjecting them to distillation with water, such as the oils of lavender, cloves, peppermint, etc.

Essequibo (es-se-kē'bō), a river of British Guiana, which flows into the Atlantic by an estuary 20 miles in width, after a course of about 450 miles. The district or division of Essequibo is well cultivated and extremely fertile producing coffee, cotton, cocoa and sugar. Pop. about 55,000.

Essex (es'seks), a maritime county in the S. E. of England, bounded by Suffolk, the Thames, Hertford and Middlesex; area, 1542 sq. miles. The surface is generally level, except in the N. W., where it is undulating and sometimes hilly. The soil is in general extremely fertile, and particularly well adapted for the growth of wheat. Beans and peas also thrive uncommonly well. The other principal productions are potatoes, barley, oats, mangolds, turnips, tares, rape, mustard and trefoil. The raising of caraway, coriander and teazel is almost peculiar to this county. It had formerly a great extent of forest, the only survival of which is Epping Forest. The principal rivers in the county are the Roding, Crouch, Chelmer, Blackwater, Colne, etc. It has also the Thames, Lea and Stour as boundary rivers. On the coast are some valuable oyster-beds, the oysters from which are exported in considerable quantities. The manufactures of the county are not very extensive, the chief being crape silks, straw plait, etc. The chief towns are Chelmsford, the county town; West Ham, Colchester, Maldon and Harwich. Pop. (1911) 1,062,000.

Essex, EARL OF. See *Cromwell, Thomas.*

Essex, ROBERT DEVEREUX, SECOND EARL OF, was born in 1567. Having appeared at court, he soon became a favorite of Queen Elizabeth, by whom he was kept in attendance against his will during the danger of the Armada. He served with more or less distinction in expeditions to Portugal and France, the latter on behalf of Henry of Navarre. In 1596 he was commander of the troops in an expedition against Spain, and distinguished himself by the capture of Cadiz. In an expedition next year he was less fortunate, and the queen, with whom he was always quarreling, received him coldly. Presuming on the favor of Elizabeth, he behaved with rudeness to her at a privy-council and received a box on the ear, and was told to 'go and be hanged.' After some months a reconciliation took place, and he was appointed lord-lieutenant of Ireland (1599), which was then in a state of rebellion. He returned to England in September, having been entirely unsuccessful in his government. He was made a prisoner in his own house, and foolishly tried to excite an insurrection in London. After a skirmish with a party of soldiers he was compelled to surrender, and sent to the Tower. He was tried for treason on February 19, and executed on February 26, 1601.

Esslingen (es'ling-ĕn), a town of Germany, in Würtemberg, on the Neckar, 7 miles E. S. E. of Stuttgart. It is of Roman origin, was long an imperial free town, has walls flanked with towers, a castle and an ancient Gothic church, with a tower 230 feet high. It has manufactures of machinery, articles of wood, cutlery, philosophical instruments, spinning and other mills, etc. Pop. (1905) 29,750.

Es-souan. See *Assouan.*

Established Church (es-tab'lisht), a church having a form of doctrine and government established by law in any country for the teaching of Christianity within its boundaries, and usually endowed by the state. The upholders of the establishment theory maintain that it is the duty of a state to provide for the religious instruction of the people. On the other hand, it is argued tha the state has no right to endow or support any particular sect or denomination, unless they assume that that denomination alone is possessed of religious truth and worth. While this is a common institution in Europe, the United States has no established church.

Estafette (es-ta-fet'), a courier who carries his message in conjunction with others by relay.

Estaminet (es-tà-mi-nā; French), a café where smoking is permitted.

Estancia (es-tan'si-a), an estate or farm in Spanish South America, especially one on which cattle are reared.

Estate (es-tāt'), the interest or quantity of interest a man has in lands, tenements or other effects. Estates are *real* or *personal*. *Real estate* comprises lands, tenements, and hereditaments, held in freehold. *Personal estate* comprises interests for terms of years in lands, tenements and hereditaments and property of every other description. *Real* estate descends to heirs; *personal* to executors or administrators. In ordinary language, an estate is a piece of landed property; a definite portion of land in the ownership of some one.

Estates of the Realm, in Britain, are the lords spiritual, the lords temporal and the commons. From the circumstance that the lords spiritual and temporal meet in one house, and practically form one branch of the legislature, the popular error has arisen that the sovereign forms one of the three estates of the realm.

Este (es'tā), a town of North Italy, 16 miles S. W. of Padua. It has a castle, the cradle of the Este family. Manufactures of silk goods, earthenware and majolica; numerous silk mills and whetstone quarries. Pop. of commune 10,962.

Este, one of the most ancient and illustrious of the families of Italy. In the eleventh century the house of Este became connected by marriage with the German Welfs or Guelphs, and founded the German branch of the house of Este, the dukes of Brunswick and Hanover. The sovereigns of Ferrara and Modena were of this family, several of them being famous as patrons of letters. The lives of Boiardo, Ariosto and Tasso were closely connected with members of this house. The last male representative of the Estes died in 1798. His daughter married a son of the German emperor Francis I, and her grandson disappeared from the land of his forefathers at the consummation of Italian unity in 1860.

Estella (es-tel'yȧ), a town of N. E. Spain, in Navarre, on the Ega, 24 miles southwest of Pampeluna. Pop. 5736.

Estepa (es-tā'pa), a town of Southern Spain, province of Seville, 50 miles east by south of Seville. It has a handsome Gothic church. Pop. 8591.

Estepona (es-tā-pō'nȧ), a seaport of Southern Spain, province of Malaga, 23 miles northeast of Gibraltar. Pop. 9310.

Esterhazy (es-ter-hā'z i), a family of Hungarian magnates, whose authentic genealogy goes back to the first half of the thirteenth century. They were zealous partisans of the house of Hapsburg, to whom, during the reigns of Frederick II and Leopold I, they lent a powerful support. Among the more prominent members of the family are—PAUL IV, PRINCE ESTERHAZY, a general and literary *savant*, 1635-1713. His grandson, NICHOLAS JOSEPH, a great patron of arts and music, founder of the school in which Hayden and Pleyel, among others, were taught. 1714-90.—NICHOLAS, PRINCE ESTERHAZY, distinguished as a field-marshal and foreign ambassador, 1765-1833.—PRINCE PAUL ANTHONY, a distinguished and able diplomatist, born in 1786; died in 1866; was successively Austrian ambassador at Dresden, Rome and Britain. He was a supporter of the national Hungarian movement.

Esther (es'ther), a Jewess, who became the queen of Ahasuerus (see *Ahasuerus*), King of Persia, and whose story is told in the book of the Old Testament called by her name. This book is supposed by some to be the composition of Mordecai himself, the uncle of the heroine. Various opinions are held regarding the time and truth of the story; but the feast of Purim which commemorates the events narrated is still observed by the Jews during the month Adar.

Esthonia (es-thō'ni-a), a maritime government of Russia, bounded by the Gulf of Finland, the Baltic, and the governments of Livonia and St. Petersburg. It includes several islands, of which the most important are Dagoe and Oesel area, about 7818 square miles. It has for the most part a flat or undulating surface. The whole of the north side, however, rises considerably above the sea, and presents to it ranges of cliffs. The Narva, which merely bounds the government on the east, is the only river of any importance; but minor streams, as well as small lakes, are very numerous. About a fourth of the surface is covered with forests of pine, birch and adler. The crops include wheat, barley and oats. The peasantry are almost all of Finnish origin and speak a Finnish dialect. It was divided between the Germans and the Danes in the 13th century and came entirely into German possession in 1346. In 1561 it passed to Sweden and in 1710 was seized by Russia. It was erected into a separate state by Germany in 1917 during the European war. Reval is the capital. Pop. 413,747.

Estivation (es-ti-vā'shun). See *Æstivation.*

Estoppel (es-top'el), in law, anything done by a party himself which puts a period to an action by closing the ground of controversy.

Estovers (es-tō'vers), in law, necessaries or supplies. *Common of estovers* is the liberty of taking the necessary wood for a house or farm from another's estate.

Estradiot (es-trad'i-ot), an Albanian dragoon or light-horseman, employed in the French army in the fifteenth and sixteenth centuries. They sometimes fought on foot as well as on horseback.

Estremadura (es-tr-ä-ma-dö'ra), a western division of Spain, consisting of the provinces of Badajoz and Caceres. It is fertile, but not cultivated to its full extent. The Tagus and Guadiana intersect it east to west. Immense flocks of sheep graze on the rich plains. The area is about 16,700 sq. miles, and the pop. 818,211.

Estremadura, a maritime province of Portugal, divided by the Tagus into two nearly equal parts, of which the northern is the more mountainous. Wines and olives are the principle produce. The principal city is Lisbon. Area, about 16,000 sq. miles. Pop. 882,-410.

Estremez, or ESTREMOZ (a-sh-trä-mōsh'), a town of Portugal, in the province of Alemtejo, 22 miles west from Elvas. Pop. 7920.

Estuary (es'tū-a-ri), the wide mouth of a river opening out so as to form an arm of the sea.

Eszek (es-sek'), or ESSEG, a strongly fortified town of Austria-Hungary, on the Drave, 13 miles from its confluence with the Danube. It has barracks, town house, normal school, etc., an important trade and several fairs. Pop. 24,930.

Etærio (e-tē'ri-o), ETERIO, in botany, a collection of distinct indehiscent carpels, either dry upon a fleshy receptacle as the strawberry, or dry upon a dry receptacle as the ranunculus, or fleshy upon a dry receptacle as the raspberry, the parts being small drupes.

Etampes (ā-tänp), a town of France, dep. Seine-et-Oise, 30 miles s. by w. from Paris. Pop. (1906) 8720.

Etappen (e-tap'en; Ger.), a department in continental armies the business of which is to relieve the commanders of the field army of all responsibility for their communications in the rear. The officers of this department supervise all arrangements for loading and unloading at stations, forwarding, feeding, billeting, etc.

Etawah (ā-tä'wä), a town of Hindustan, N. W. Provinces, capital of the district of same name, on the left bank of the Jumna, picturesquely situated among ravines, and richly planted with trees. It has some good buildings and a considerable trade. Pop. 42,-570. The DISTRICT has an area of 1691 square miles, and a pop. of about 806,-798.

Etching (ech'ing), the art of producing designs upon a plate of steel or copper by means of lines drawn with an *etching needle* (a fine-pointed steel tool), the lines being drawn through a coating or varnish (the *ground*), and *bitten in* by some strong acid which can only affect the plate where the varnish has been removed. See *engraving.*

Etchmiadzin. See *Armenia.*

Eteocles, Polynices (e-te'o-klēz, po-li-nī'sēz), two heroes of ancient Greek legend, sons of Œdipus, king of Thebes. After their father's banishment from Thebes, Eteocles usurped the throne to the exclusion of his brother, an act which led to an expedition of Polynices and others against Thebes. The two brothers fell by each other's hand. See *Antigone.*

Etesian Winds (e-tē'zi-an), winds blowing at stated times of the year; applied especially to northerly and northeasterly winds which prevail at certain seasons in the Mediterranean regions.

Ethelbert (eth'el-bert), King of Kent, born about 560; died in 616. He succeeded his father, Hermenric, and reduced all the Anglo-Saxon states, except Northumberland, to the condition of dependencies. Ethelbert married Bertha, the daughter of Caribert, king of Paris, and a Christian princess, an event which led indirectly to the introduction of Christianity into England by St. Augustine. Ethelbert was the first Anglo-Saxon king to draw up a code of laws.

Ethelbert, King of England, son of Ethelwulf, succeeded to the government of the eastern side of the kingdom in 857, and in 860, on the death of his brother Ethelbald, became sole king. His reign was much disturbed by the inroads of the Danes. He died in 866.

Ethelred I (eth'el-red), King of England, son of Ethelwulf, succeeded his brother Ethelbert in 866. The Danes became so formidable in his reign as to threaten the conquest of the whole kingdom. Ethelred died in

consequence of a wound received in an action with the Danes in 871, and was succeeded by his brother Alfred.

Ethelred II, King of England, son of Edgar, born in 968, succeeded his brother, Edward the Martyr, in 978, and, for his want of vigor and capacity, was surnamed *the Unready*. In his reign began the practice of buying off the Danes by presents of money. After repeated payments of tribute he effected, in 1002, a massacre of the Danes; but this led to Sweyn gathering a large force together and carrying fire and sword through the country. They were again bribed to depart; but, upon a new invasion, Sweyn obliged the nobles to swear allegiance to him as king of England; while Ethelred, in 1013, fled to Normandy. On the death of Sweyn he was invited to resume the government, and died at London in the midst of his struggle with Canute (1016.)

Ethelwulf (eth'el-wulf), King of England, succeeded his father, Egbert, about 837; died in 857. His reign was in a great measure occupied in repelling Danish incursions; but he is best remembered for his donation to the clergy, which is often quoted as the origin of the system of tithes.

Ether (ē'ther), ÆTHER, a hypothetical medium of extreme tenuity and elasticity supposed to be diffused throughout all space (as well as among the molecules of which solid bodies are composed), and to be the medium of the transmission of light and heat, and probably also the agent active in gravitation.

Ether, in chemistry, a very light, volatile, and inflammable fluid, produced by the distillation of alcohol with sulphuric acid. It is lighter than alcohol, of a strong, sweet smell, susceptible of great expansion, and has a pungent taste. A mixture of vapor of ether with atmospheric air is extremely explosive. Its formula is $(C_2H_5)_2O$. Ether produces an intoxication of short duration, and is extensively used as an anæsthetic for surgical operations.

Etherege (eth'ē-rej), SIR GEORGE, an English writer of comedy, was born about 1636. He studied at Cambridge, traveled afterwards on the continent, and then returned to enter himself at one of the Inns of Court. But he devoted himself less to legal studies than to literature and society. In 1664 he had his first comedy represented, *The Comical Revenge, or Love in a Tub*, which was well received. Four years later his *She Would if She Could*, appeared, a brilliant play, though frivolous and immoral. Eight years afterwards (1676) he produced his best comedy, *Sir Floping Flutter, or the Man of Mode*. Etherege's plays are witty and sparkling, and the characters, genuine portraits of the men and women he saw, are vividly if lightly drawn. He died about 1688.

Etherene (ē'ther-ēn). See *Ethylene*.

Ethical Culture. Societies bearing this title originated in New York in 1876, at the instance of Mr. Felix Adler, and have extended to some other American cities and to several foreign countries. Their purpose is to deal with ethical questions without regard to creed. Their meetings are addressed by speakers on the subject of practical morality, no form of ritual being observed and no special belief demanded.

Ethics (eth'iks), otherwise called *Moral Philosophy* or *Morals*, is the science which treats of the nature and laws of the actions of intelligent beings, considered as to whether they are *right* or *wrong*, *good* or *bad*. The science is more or less closely connected with theology, psychology, politics, political economy and jurisprudence, but what most strictly belongs to it is the investigation of the principles and basis of duty or the moral law, and a inquiry into the nature and origin of the faculty by which duty is recognized. Various answers have been given to the question why we call an action good or bad, such as that it is consistent or not with the will of God, or with the nature of things, or with the greatest happiness of the greatest number, or that an inward faculty decides it to be such or such; and a great variety of *ethical* systems have been proposed. The foundations of the leading systems were laid in antiquity, the names of Socrates, Plato, Aristotle, Epicurus, the Cynics and the Stoics being especially prominent. The introduction of Christianity brought a new element into ethical speculation, and among Christians ethics were intimately associated with theology, and morality was regarded as based on and regulated by a definite code contained in the sacred writings. The speculations of the Greeks were not, however, disregarded, and some of the ablest Christian moralists (as Augustine, Peter Lombard, Erigena, Anselm, Aquinas, etc.) endeavored to harmonize the Greek theories with the Christian dogmatics. Most modern ethical systems consider the subject as apart from theology and as based on independent philosophical principles, and they fall into one of two

great classes—the utilitarian systems, which recognize, as the chief good, happiness, or the greatest possible satisfaction of the tendencies of our nature; and the rationalistic systems, which recognize that ideas of law and obligation can have their source only in reason. The first of the modern school in England was Hobbes (1588-1679). Among those who maintain the utilitarian theory of morals is Paley, who holds that men ought to act so as to further the greatest possible happiness of the race, because God wills the happiness of men, and rewards and punishes them according to their actions, the divine commands being ascertained from Scripture and the light of nature. Bentham's utilitarianism is considerably different from Paley's. It was entirely dissociated from theology or Scripture, and maintained that increase of happiness ought to be the sole object of the moralist and legislator, pleasure and pain being the sole test of actions. To utilitarianism as a special development belong the later 'evolution ethics' represented by Mr. Herbert Spencer, in which biological conceptions, such as 'the preservation of the human race,' take the place of the Benthamite criterion for determining what is good and bad in actions. Another theory of ethics places the moral principle in the sentimental part of our nature, that is, in the direct sympathetic pleasure or sympathetic indignation we have with the impulses which prompt to action or expression. By means of this theory, which he treats as an original and inexplicable fact in human nature, Adam Smith explains all the phenomena of the moral consciousness. In considering the systems which recognize that the ideas of law and obligation can have their source only in reason, the question, what is the source of the laws by which reason governs, gives rise to a number of psychological theories, among which we may notice Clark's view of the moral principles as rational intuitions or axioms analogous to those of mathematics; Butler's theory of the natural authority of conscience; the position of Reid, Stewart and other members of the later intuitional school, who conceive a moral faculty implanted in man which not only perceives the 'rightness' or 'moral obligation' of actions, but also impels the will to perform what is seen to be right. Very similar so far as classification goes is the position of Kant, who holds that reason recognizes the immediate obligation of certain kinds of conduct, and that an action is only good when done from a good motive, and that this motive must be essentially different from a natural inclination of any kind.

Ethiopia (ē-thi-ō'pi-a), or ÆTHIOPIA (Hebrew, *Cush*), in ancient geography, the country lying to the south of Egypt, and comprehending the modern Nubia, Kordofan, Abyssinia and other adjacent districts; but its limits were not clearly defined. It was vaguely spoken of in Greek and Roman accounts as the land of the *Ichthyophagi* or fish eaters, the *Macrobii* or long livers, the *Troglodytes* or dwellers in caves, and of the *Pygmies* or dwarf races. In ancient times its history was closely connected with that of Egypt, and about the eighth century B.C. it imposed a dynasty on Lower Egypt, and acquired a predominant influence in the valley of the Nile. In sacred history Ethiopia is repeatedly mentioned as a powerful military kingdom (see particularly Isaiah, xx, 5). In the sixth century B.C. the Persian Cambyses invaded Ethiopia; but the country maintained its independence till it became tributary to the Romans in the reign of Augustus. Subsequently Ethiopia came to be the designation of the country now known as Abyssinia, and the Abyssinian monarchs still call themselves rulers of Ethiopia.

The *Ethiopian Language*, or more accurately the *Geez* language, is the old official and ecclesiastical language of Abyssinia, introduced into that kingdom by settlers from South Arabia. In the fourteenth century it was supplanted as the language of the Christian church of Abyssinia by the Amharic. It is a Semetic language resembling Aramaic and Hebrew as well as Arabic. It has a Christian literature of some importance. The principal work is a translation of the Bible, including the Old and New Testaments and Apocrypha, to which are appended some non-canonical writings, such as the *Shepherd of Hermas* and the *Book of Enoch*. The language is to some extent represented by the modern dialects of Tigre and by that spoken by some nomadic tribes of the Soudan. For the Ethiopian or Abyssinian Church, see *Abyssinia* and *Copts*.

Ethiops Mineral (ē'thi-ops), the black sulphide of mercury, prepared by rubbing mercury and sulphur together, either hot or cold.

Ethmoid Bone (eth'moid), a light spongy bone situated between the orbital processes at the root of the nose. The olfactory nerves shoot down through its numerous perforations to the nose.

Ethnology and Ethnography

(eth-nol'ō-ji, eth-nog'ra-fi), sciences treating of man, the former analyzing the social phenomena of mankind as shown in their customs, languages, institutions, etc.; the latter being more concerned with descriptive details and the orderly collection of facts relating to particular tribes and localities. Besides these terms there is the term *anthropology*, used by some to indicate the general science or natural history of mankind, of which the other two are parts. Here we can only give a few particulars bearing on the strictly ethnological and ethnographic divisions of the subject. (As to the place of man in the animal kingdom, see *Man.*) The unity or plurality of species of the human race is a question which has given rise to much discussion. The most common view has probably been that which regards all mankind as descended from Adam and Eve, attributing the great differences exhibited by different races to climate and other causes acting for a long period of time. Many have held that such differences were to be so accounted for, and that the various typical races of the earth were not descended from a single pair, but were separately created in separate localities. The belief that man may have originated from a single pair is supported by the researches of Darwin, who has shown how an accumulation of differences amounting to the appearance of a distinct species may arise from continual modifications of a single primordial form. (See *Species.*) Certainly among men the variability of the same race under different climatic conditions is very striking. Even within a comparatively small period of time physical surroundings have induced typical differences between the lithe, sparely fleshed Yankee of New England and the plump, rosy-cheeked Englishman; and the Boer of South Africa, with its dry climate, has developed a type as decidedly different from his original stock in moist Holland. The theory of the development of the human race from a single species demands a vast duration of time; and the flint implements discovered intermingled with remains of the mammoth and other extinct animals have proved that man was a contemporary of the mammoth, the cave bear, and other mammalia of the geological period antecedent to our own, though how distant that period was as measured by thousands of years it is difficult to say. Another interesting point is in regard to the first home of the human race. This, of course, is quite uncertain, though we may naturally conclude that where the mammalia of the highest characteristics appear there was the possible birthplace and center of distribution of mankind.

When we attempt to classify mankind we can scarcely find any one physical characteristic belonging exclusively to a single race. At most we can only say that certain characteristics are the preponderant ones in certain races. In seeking racial characteristics ethnologists make use of various principles of classification. Some give the first place to the shape of the head. Camper, the Dutch anatomist, was the first who attempted to make a scientific distinction of races on this principle, taking as the basis of measurement the amount of the facial angle. (See *Facial Angle.*) But Camper's method, though it illustrates excellently the great differences which exist between, say, the anthropoid apes with an angle of 42°, the African negro with an angle of 70°, and the European with an angle of 80°, is without certainty, it being possible to find in the population of a single large town as wide variations of the facial angle as exist between distinct races. Camper's method was therefore superseded by the method of Blumenbach, which is based on consideration of all the chief distinctions in shape of the head, according to which he classified the human family into five varieties the Caucasian, Mongolian, Ethiopian, Malay and American. These five varieties were cut down to three by Cuvier, who treated the Malay and American as subdivisions of the Mongolian; and extended by Dr. Prichard, who divided the Caucasian class into a Semitic and an Aryan or Indo-European class. Latham's classification was into: 1, Mongolidæ (Chinese, Turks, Malays, American races, etc.); 2, Atlantidæ (African races, Jews and Arabs); 3, Japetidæ (Indo-Europeans). Among the later attempts made to find a new principle of classification we may mention that of Retzius, based on the relative length and breadth of the skull, according to which mankind is divided into *Dolichocephalic*, or long-skulled, and *Brachycephalic*, or short, broad-skulled races. Later developments of craniology have introduced a third class, the *Mesocephalic*, representing a mean between the other two. The general rule for measurement is that the longitudinal diameter being rated as 100, the lateral diameter is expressed in a percentage of these units. If the index of breadth is from 74 to 78, the skull is termed mesocephalous; if below 74, it is dolichoceph-

alous, a narrow or long skull; if it reaches 79, it is brachycephalous, a broad or short skull. The capacity of the brain cavity is also a favorite method with some ethnologists. Here the European stands highest with 92.1 cubic inches; the Australian lowest with 81.7. The character of hair and color of skin have been used by Huxley as the basis of his classification, which divides mankind into: 1, *Ulotrichi*, crisp, or wooly haired people with yellow or black skin, comprising Negroes, Bushmen and Malays; 2, *Leiotrichi*, smooth-haired people, subdivided into Australioid, Mongoloid, Xanthochroic (fair whites), and Melanochroic (dark whites) groups. But many ethnologists hesitate to accept a classification which brings together nations apparently unrelated, such as the Australians, the ancient Egyptians, and the tribes of Southern India. On the other hand, the character of the hair is found to be one of the surest tests in separating neighboring races, such as the Papuan, and the Malayan and Australian tribes. Oscar Peschel's classification, based on a number of different particulars, such as the shape of the skull, the color of the skin, the nature and color of the hair, the shape of the features, etc., is as follows:—

1. *The Australians.*—Characters: skull of the dolichocephalic type, the jaws being also prognathous or protruded. The nose is narrow at the root, widening greatly below. The mouth is wide and unshapely. The body is thickly covered with hair; the hair is black, elliptical in section, that on the head being frizzly, and standing out so as to form a shaggy crown. The color of the skin is dark as a rule, sometimes black, though a light copper-red also occurs.

2. *The Papuans.*—This race, which is the one most closely allied to the Australians, occupies New Guinea, New Caledonia, the Solomon Islands, New Hebrides, the Fiji Islands, etc. The most distinctive mark is their peculiarly flattened and abundant hair, growing in tufts, and forming a spreading crown round the head. The skin is always dark, the skull high and narrow (dolichocephalic); the jaws prognathous; the lips fleshy and somewhat swollen; the nose hooked somewhat after the Jewish type.

3. *The Mongoloid Nations.*—To this race belong the Polynesian and Asiatic Malays, the people of Southeastern and Eastern Asia, the Tibetese, all the Northern Asiatics, with their kinsmen in Northern Europe, and lastly the aboriginal population of America. The common characteristics are: long, straight hair, circular in section; almost complete absence of beard and body hair; skin dark colored, varying from leather yellow to deep brown, sometimes inclining to red; prominent cheek-bones, and eyes in general set obliquely. The various members of the Mongoloid race may be classed under the following subdivisions: (*a*) The *Malay race*, comprising the Malays of Malacca, Sumatra, Java, etc., the inhabitants of Madagascar, the New Zealanders, the natives of the Sandwich Islands, etc. (*b*) *Southern Asiatics with monosyllabic languages*, comprising the Chinese, Indo-Chinese (Burmese, Siamese, Anamese, etc.), Tibetese, etc. (*c*) *Coreans and Japanese.* (*d*) *Northern Mongoloids of the Old World*, comprising the true Mongols, Turks, Finns, Lapps, Magyars, Bulgarians, etc., all much resembling the Chinese and Indo-Chinese group in physical characters. (*e*) *Northern Nations of doubtful position.*—The Yenisei Ostiaks, the Ainos of Yesso, the inhabitants of Saghalien, etc. (*f*) *The Bering Nations*, of which the Esquimaux, or Eskimo, are the most important. (*g*) *The American Aborigines* or Red Indians.

4. *The Dravidians or Aborigines of India.*—These tribes have the skin generally very dark, frequently quite black; their hair is long and black, not straight but crimped or curly; the hair of beard and body grows profusely; the lips are thick and fleshy, somewhat like those of the negroes, but the jaws are never prominent. The Dravidians comprise the Tamuls, Telugus, Gonds, Santals or Sonthals, etc.

5. *The Hottentots and Bushmen.*—These are tribes of little importance inhabiting South Africa. They have the hair tufted and matted, the beard scanty, the body almost hairless; the lips are full, but not so much so as with the negroes; the nose is of the snub shape; the opening of the eyes is narrow but not oblique. They are slimly built, and the Bushmen in particular low in stature; their color is yellowish or yellowish brown.

6. *The Negroes.*—The negroes inhabit Africa from the southern margin of the Sahara to the territory of the Hottentots and Bushmen, and from the Atlantic to the Indian Ocean. They display great variety in external characteristics, and what is popularly considered the typical negro is rarely met with. The color of the skin passes through every gradation, from ebony-black to dark brown, copper-red, olive or yellow. In some tribes the nose is straight, in

others hooked, though often broad and flat. The hair of the head is generally short, elliptical in section, and much crimped; that on the body is not plentiful; whiskers are comparatively rare. The negroes may be divided into the Bantu negroes (including the Kaffirs, Bechuanas, etc.) and the Soudan negroes, these divisions being based on differences in language. It is in the Soudan region that the most typical members of the negro race are found.

7. *The Mediterranean Nations.*—These include all Europeans who are not Mongoloids, the North Africans, all Western Asiatics and the Hindus. Among them are the highest members of the human race. The nothern nations have the skin quite fair; the southern have it darker; in North Africa and Eastern Asia it becomes yellow, red or brown. The nose has always a high bridge prognathism and prominence of the jaws and cheek-bones are rare; the lips are never intumescent, and in no other race are refined and noble features so frequent. Subdivisions are: (*a*) *The Hamites*, comprising the ancient Egyptians, the Copts of Egypt and the Nubians, the Berbers and Gallas. (*b*) *The Semites.*—These comprise the Jews, Arabs and Abyssinians and the ancient Canaanites, Assyrians, Babylonians and Phœnicians. (*c*) *The Indo-European or Aryan family.*—This family is divided into two branches, a European and an Asiatic. The European comprises the Germanic or Teutonic nations (English, Germans, Dutch, Danes, Norwegians, Swedes, etc.), the Romance nations (French, Italians, Spaniards, Portuguese), the Slavonians (Russians, Bohemians, Servians, etc.), the Greeks, and lastly the Celts. The Asiatic comprises the Hindus, Afghans, Persians, Armenians and Kurds. (*d*) *Europeans of doubtful position.*—These include the Basques of the northeast of Spain and southwest of France and various tribes in the Caucasus.

Ethyl (eth'il), the name given to the radicle C_2H_5, which is contained in ether and alcohol. It is a colorless gas, which is liquefied by moderate cold and pressure, and which burns with a brilliant white flame.

Ethylamine (eth'il-a-mēn), an organic base formed by the substitution of ethyl for all or part of the hydrogen of ammonia. It has the odor and many of the reactions of ammonia.

Ethylene (eth'il-ēn). See *Olefiant Gas.*

Etienne (ā-ti-ān), St., a town of Southern France, dep. Loire, on the Furens, 32 miles s. w. of Lyons. It has spacious streets with substantial houses but owing to the number of public works presents a dingy appearance. The principal buildings and institutions are the cathedral, an ancient Romanesque structure; the town house, courthouse, exchange, communal college, mining school, gallery of arts, library and museum. The town stands in the center of one of the most valuable mineral fields of France; and in addition to the extensive collieries, blast-furnaces and other ironworks in the vicinity, has manufactures of ribbons, silks, cutlery, firearms, etc. The colleries alone employ about 16,000 men. Pop. (1911) 148,656.

Etiolation (ē-ti-o-lā'shun; Fr. *étioler*, to blanch), or Blanching of plants, is a state produced by the absence of light, through which the green coloring is prevented from forming. It is effected artificially, as in the case of celery, by raising up the earth about the stalks of the plants; by tying the leaves together to keep the inner ones from the light; by covering with pots, boxes, or the like, or by setting in a dark place. The green color of etiolated plants may be restored by exposure to light.

Etiquette (et'i-ket), a collective term for the established ceremonies and usages of society, from the forms which are to be observed in particular places, such as courts, levees and public occasions, to the general forms of polite society. Among courts the Byzantine and Spanish courts, and the French court under Louis XIV and XV, have been noted for their strictness of their etiquette. Social etiquette consists in so many minute observances that a tolerable familiarity with it can be acquired only by a considerable intercourse with polite society. It is often said that all that is necessary to constitute good social manners is common sense and good feeling; but not to mention those formal rules of society which, though intrinsically worthless, demand a certain amount of respect, there are also many difficulties and emergencies in social intercourse which require peculiar tact and delicacy of judgment. Hence quickness of sympathy and a certain fineness of observation are more needed for proficiency in this sphere than pure power of intellect.

Etive (et'iv), Loch, an inlet of the sea, on the west coast of Scotland, County Argyle, nearly 20 miles long, of very unequal breadth, but at the broadest part about 1½ miles. The

scenery of its shores is very beautiful. About three miles from the sea, at Connel Ferry, a ridge of sunken rocks crossing it causes a turbulent rapid, which at half-tide forms a sort of waterfall.

Etna (et'na), or ÆTNA, MOUNT, the greatest volcano in Europe, a mountain in the province of Catania in Sicily; height, 10,874 feet. It rises immediately from the sea, has a circumference of more than 100 miles, and dominates the whole northeast part of Sicily, having a number of towns and villages on its lower slopes. The top is covered with perpetual snow; midway down is the woody or forest region; at the foot is a region of orchards, vineyards, olive groves, etc. Etna thus presents the variety of climates common to high mountains in lower latitudes, oranges and lemons and other fruits growing at the foot, the vine rather higher up, then oaks, chestnuts, beeches and pines, while on the loftiest or desert region vegetation is of quite a stunted character. A more or less distinct margin of cliff separates the mountain proper from the surrounding plain; and the whole mass seems formed of a series of superimposed mountains, the terminal volcano being surrounded by a number of cones, all of volcanic origin, and nearly 100 of which are of considerable size. The different aspects of the mountain present an astonishing variety of features—woods, forests, pastures, cultivated field, bare rocky precipices, streams of lava, masses of ashes and scoriæ, as also picturesque towns and villages. From the summit the view presents a splendid panorama, embracing the whole of Sicily, the Lipari Islands, Malta and Calabria. The eruptions of Etna have been numerous, and many of them destructive. That of 1169 overwhelmed Catania and buried 15,000 persons in the ruins. In 1669 the lava spread over the country for forty days, and 10,000 persons are estimated to have perished. In 1693 there was an earthquake during the eruption, when over 60,000 lives were lost. One eruption was in 1755, the year of the Lisbon earthquake. Among more recent eruptions are those of 1832, 1865, 1874, 1879. An eruption is ordinarily preceded by premonitory symptoms of longer or shorter duration.

Etna, a borough of Allegheny Co., Pennsylvania, 2 miles N. of Pittsburgh. It has rolling-mills, steel mills, tube and pipe works, electric railway supply works, etc. Pop. 5830.

Eton (ē'ton), a town of England, in Buckinghamshire, on the left bank of the Thames, and opposite Windsor, 22 miles west of London. Eton derives its celebrity wholly from its college, one of the great public schools of England, founded by Henry VI in 1440. The building, which was commenced in 1441 and finished in 1523, has received important additions in recent times in the shape of mathematical and science schools, a museum, etc. The number of scholars on the foundation is fixed at seventy, but there are about 800 other scholars (mostly the sons of wealthy parents) who are boarded in the houses of the masters. The town is connected with Windsor by a bridge across the river. Pop. (1911) 3192.

Etruria (e-trō'ri-a; Greek, *Tyrrhenia*), the name anciently given to that part of Italy which corresponded partly with the modern Tuscany, and was bounded by the Mediterranean, the Apennines, the river Magra and the Tiber. The name of Tusci or Etrusci was used by the Romans to designate the race of people anciently inhabiting this country, but the name by which they called themselves was Rasena (or perhaps more correctly Ta-rasena). These Rasena entered Italy at a very early period from the north, and besides occupying Etruria proper, extended their influence to Campania, Elba and Corsica. Etruria proper was in a flourishing condition before the foundation of Rome, in 753 B.C. It was known very early as a confederation of twelve great cities, each of which formed a republic of itself. Among the chief were Veii, Clusium, Volsinii, Arretium, Cortona, Falerii and Fæsulæ; but the list may have varied at different epochs. The chiefs of these republics were styled *lucumōnes*, and united the office of priest and general. They were elected for life. After a long struggle with Rome the Etruscan power was completely broken by the Romans in a series of victories, from the fall of Veii, in 396 B.C., to the battle at the Vadimonian Lake (283 B.C.). The Etruscans had attained a high state of civilization. They carried on a flourishing commerce, and at one time were powerful at sea. They were less warlike than most of the nations around them, and had the custom of hiring mercenaries for their armies. Of the Etruscan language little is known, although more than 3000 inscriptions have been preserved. It was written in characteristics essentially the same as the ancient Greek; but philologists have not as yet been able to decide with what language it is connected, nor to agree in the decipherment of almost any inscription. The Etruscans were specially distinguished by their religious in-

stitutions and ceremonies, which reveal tendencies gloomy and mystical. Their gods were of two orders, the first being nameless, mysterious deities, exercising a controlling influence in the background on the lower order of gods, who managed the affairs of the world. At the head of these was a deity resembling the Roman Jupiter (in Etruscan *Tinia*). But it is characteristic of the Etruscan religion that there was also a Vejovis or evil Jupiter. The Etruscan name of Venus was *Turan*, of Vulcan *Sethlans*, of Bacchus *Phuphluns*, of Mercury *Turms*. Etruscan art was in the main borrowed from Greece. For articles in terra cotta, a material which they used mainly for ornamental tiles, sarcophagi and statues, Etruscans were especially celebrated. In the manufacture of pottery they had made great advances; but most of the painted vases popularly known as Etruscan are undoubtedly productions of Greek workmen. (See *Etruscan Vases.*) The skill of the Etruscans in works of metal is attested by ancient writers, and also by numerous extant specimens, such as necklaces, ear-rings, bracelets, etc. The bronze candelabra, of which many examples have been preserved, were eagerly sought after both in Greece and Rome. A peculiar manufacture was that of engraved bronze mirrors. These were polished on one side and have on the other an engraved design, taken in most cases from Greek legend of mythology. The Etruscans showed great constructive and engineering skill. They were acquainted with the principle of the arch, and the massive ruins of the walls of their ancient cities still testify to the solidity of their constructions. Various arts and inventions were derived by the Romans from the Etruscans.

Etruscan Language (e-trus'kan). See *Etruria.*

Etruscan Vases, a class of beautiful ancient painted vases made in Etruria, but not strictly speaking a product of Etruscan art, since

Etruscan Vases.

they were really the productions of a ripe age of Greek art, the workmanship, subjects, style and inscriptions being all Greek. They are elegant in form and enriched with bands of beautiful foliage and other ornaments, figures and similar subjects of a highly artistic character. One class has black figures and ornaments on a red ground—the natural color of the clay; another has the figures of the natural clay color and the ground painted black. The former class belong to a date about 600 B.C., the latter date about a century later, and extend over a period of about 300 or 350 years, when the manufacture seems to have ceased. During this period there was much variety in the form and ornamentation, gold and other colors besides the primitive ones of black and red being frequently made use of. The subjects represented upon these vases frequently relate to heroic personages of the Greek mythology, but many scenes of an ordinary and even of a domestic character are depicted. The figures are usually in profile; temples are occasionally introduced; and many curious particulars may be learned from these vase pictures regarding the Hellenic ritual, games, festivities and domestic life.

Ettlingen (et'ling-en), a town of Baden, 5 miles from Carlsruhe, with manufactures of linen and cotton goods, etc. Pop. (1905) 8040.

Ettrick (et'trik), a district of Scotland, in Selkirk, through which the Ettrick water runs. It is now a sheep-pasture denuded of wood, but anciently formed part of Ettrick Forest, which included the whole country as well as parts of Peebles and Edinburghshire. The *Ettrick Shepherd*, James Hogg, was a native of this district.

Etty (et'ti), WILLIAM, an English painter, born in 1787; died in 1849. He studied at the Royal Academy. He worked long without much recognition, but at length in 1820 he won public notice by his *Coral Finders.* In 1828 he was elected an academician. Among his works, which were greatly admired, is a series of three pictures (1827-31) illustrating the *Deliverance of Bethulia by Judith; Benaiah, one of David's mighty men; Women interceding for the Vanquished.* All these are very large pictures, and are now in the National Gallery of Scotland. Others of note are *The Judgment of Paris, The Rape of Proserpine, Youth at the Prow and Pleasure at the Helm.* In coloring and the representation of the nude or partially nude figure, particularly females, he displays high ability.

Etymology (et-i-mol'ō-ji), a term applied (1) to that part

of grammar which treats of the various inflections and modifications of words and shows how they are formed from simple roots; (2) to that branch of philology which traces the history of words from their origin to their latest form and meaning. Etymology in this latter sense, or the investigation of the origin and growth of words, is amongst the oldest of studies. Plato and other Greek philosophers, the Alexandrian grammarians, the scholiasts, the Roman Varro, and others wrote much on this subject. But their work is made up of conjectures at best ingenious rather than sound, and very often wild and fantastic. It was not till recent times, and particularly since the study of Sanskrit, that etymology has been scientifically studied. Languages then began to be properly classed in groups and families, and words were studied by a comparison of their growth and relationship in different languages. It was recognized that the development of language is not an arbitrary or accidental matter, but proceeds according to general laws. The result was a great advance in etymological knowledge and the formation of a new science of philology (which see).

Etzel (et'zel). See *Attila.*

Eu (*eu*), a town in Northern France, dep. Seine-Inférieure, about 17 miles northeast of Dieppe. It is notable for its old church and the celebrated Château d'Eu. Pop. (1906) 4865.

Eubœa (û-bē'a), formerly called Negropont, a Greek island, the second largest island of the Ægean Sea. It is 90 miles in length; 30 in greatest breadth, and reduced at one point to 4 miles. It is separated from the mainland of Greece by the narrow channels of Egripo and Talanta. It is connected with the Bœotian shore by a bridge. There are several mountain peaks over 2000 feet, and one over 7000 feet. The island is well wooded and remarkably fertile. Wine is a staple product, and cotton, wool, pitch and turpentine are exported. The chief towns are Chalcis and Karysto. The island was anciently divided among seven independent cities, the most important of which were Chalcis and Eretria, and its history is for the most part identical with that of those two cities. With some small islands it forms a modern nomarchy, with a pop. of (1907) 116,903.

Eubulus (û-bu'lus), a Greek comic writer who flourished at Athens about B.C. 375. His subjects were chiefly mythological.

Eucalyptus (û-ka-lip'tus), a genus of trees, nat. order Myrtaceæ, mostly natives of Australia, and remarkable for their gigantic size, some of them attaining the height of 480 or 500 feet. In the Australian colonies they are known by the name of gum trees, from the gum which exudes from their trunks; and some of them have also such names as 'stringy bark,' 'iron bark,' etc. The wood is excellent for shipbuilding and such purposes. The *E. globŭlus*, or blue gum, yields an essential oil which is valuable as a febrifuge, antiasthmatic and antispasmodic; the medicinal properties of this tree also make it useful as a disinfectant, and as

Blue Gum Tree (*Eucalyptus globŭlus*).

an astringent in affections of the respiratory passages. The *E. globŭlus* and the *E. amygdalīna* are found to have an excellent sanitary effect when planted in malarious districts such as the Roman Campagna, parts of which have been reclaimed by their use. This result is partly brought about by the drainage of the soil (the trees absorbing great quantities of moisture), partly perhaps by the balsamic odor given out. *E. manniféra* and others yield a sweet secretion resembling manna. Some yield a kind of gum kino. The *Eucalyptus* has been introduced with success into India, Algiers, the South of Europe, etc., and has been extensively planted in California, and, with the object of lessening liability to droughts, along the Central Pacific R. R.

Eucharist (û'ka-rist; Greek *eucharistia*, from *eu*, well, and *charis*, grace), a name for the sacrament of the Lord's supper, in reference to the blessing and thanksgiving which accompany it. See *Lord's Supper.*

Euchre (û'kẽr), a game at cards, very popular in America,

played mostly by two or four persons. After cutting for the deal, five cards are dealt (either by twos and threes or by threes and twos) to each player. The uppermost card of those undealt is turned for trump. The first player has the option either to 'order up' (*i.e.*, to make this card trump) or 'pass.' In the latter case it is left to the next player to decide if he will play first or pass, and so on till the turn of the dealer comes, who must either play on this trump or turn it down, when all the players have again their choice in turn of making a new trump or passing. If a trump is 'ordered up' or taken in the first round, the dealer may take it into his cards, discarding instead his poorest card. If the player who elects to play wins five tricks, he counts two; if he wins three tricks he counts one; if he wins fewer than three tricks he is *euchred* and each independent opponent counts two. The cards rank as at whist, except that the knave of the trump suit, called the *right bower* (from Ger. *bauer*, a peasant), is the highest card, and the knave of the other suit of the same color the second highest. In euchre, as now played, there is an additional card, known by players as the joker, which is the highest trump in every suit.

Eucken (oy'ken), RUDOLPH, a German philosopher, born at Aurich in East Friesland, January 5, 1846. He studied at Göttingen and Berlin; taught philosophy at Basel, 1871-74; and from that time became professor of philosophy at the University of Jena. In 1908 he was awarded the Nobel prize for literature. Philosophy, Eucken holds, is not mere intellectualism, but the application of vital religious inspiration to the practical problems of society. This practical idealism he describes as 'Activism.' His works best known in English are *The Life of the Spirit*, the *Truth of Religion*, and *Life's Purpose and Life's Ideal*. In 1912 he came to America as exchange professor, lecturing at Harvard.

Euclid (ū'klid; *Eucleidēs*), of Alexandria, a distinguished Greek mathematician, who flourished about 300 B.C. His *Elements of Geometry* (*Stoicheia*), in thirteen books, is still extant, and forms the most usual introduction to the study of geometry. The severity and accuracy of his methods of demonstration have as a whole never been surpassed. Besides the *Elements*, some other works are attributed to Euclid.

Euclid (*Eucleidēs*), of Megara, an ancient Greek philosopher, the founder of the Megaric school of philosophy, and a pupil of Socrates.

Eudiometer (ū-di-o m'e-tėr; Gr. *eudios*, serene), an instrument originally designed for ascertaining the purity of the air or the quantity of oxygen it contains, but now employed generally in the analysis of gaseous mixtures. It consists of a graduated glass tube, either straight or bent in the shape of the letter U, hermetically sealed at one end and open at the other. Two platinum wires, intended for the conveyance of electric sparks through any mixture of gases, are inserted through the glass near the closed end of the tube, and approach but do not touch each other. The electric spark causes chemical combination to take place between the oxygen in the gas to be analyzed and hydrogen which has been introduced into the tube, and the nature and proportion of the constituents of the gaseous mixture are determined by the diminution in volume after the passing of the spark. Or certain substances, such as caustic potash, pyrogallic acid, etc., may be introduced into the closed tube in order to absorb the gases.

Eufaula (ū-fą'la), a city of Barbour Co., Alabama, on the Chattahoochee River, 80 miles S. E. of Montgomery. It is an important shipping point for cotton, and has cotton mills, oil mills, etc. Pop. 4259.

Eugene (ū-jēn'), or FRANÇOIS EUGÈNE, Prince of Savoy, fifth son of Eugène Maurice, Duke of Savoy-Carignan, and Olympia Mancini, a niece of Cardinal Mazarin, was born at Paris, October 18, 1663. Offended with Louis XIV, he entered the Austrian service in 1683, serving his first campaign as a volunteer against the Turks. Here he distinguished himself so much that he received a regiment of dragoons. Later, at the sieges of Belgrade and Mayence, he increased his reputation, and on the outbreak of war between France and Austria he received the command of the imperial forces sent to Piedmont to act in conjunction with the troops of the Duke of Savoy. At the end of the war he was sent as commander-in-chief to Hungary, where he defeated the Turks at the battle of Zenta (Sept. 11, 1697). The Spanish war of succession brought Eugene again into the field. In Northern Italy he outmaneuvered Catinat and Villeroi, defeating the latter at Cremona (1702). In 1703 he commanded the imperial army in Germany and in coöperation with Marlborough frustrated the plans of France and her allies. In the battle of Höchstadt or Blenheim, Eugene and Marlborough defeated the French

and Bavarians under Marshal Tallard, Aug. 13, 1704. Next year Eugene, returning to Italy, forced the French to raise the siege of Turin, and in one month drove them out of Italy. During the following years he fought on the Rhine, took Lille, and, in conjunction with Marlborough, defeated the French at Oudenarde (1708), and Malplaquet (1709), where he himself was dangerously wounded. After the recall of Marlborough, which Eugene opposed in person at London, without success, and the defection of England from the alliance against France, his farther progress was in a great measure checked. In the war with Turkey, in 1716, Eugene defeated two superior armies at Peterwaradin and Temesvar, and, in 1717, took Belgrade, after having gained a decisive victory over a third army that came to its relief. During fifteen years of peace which followed, Eugene served Austria as faithfully in the cabinet as he had done in the field. He died in Vienna April 21, 1736. He was one of the great generals of modern times.

Eugene, a city, county seat of Lane Co., Oregon, on the Willamette River. It is surrounded by mountains, is noted for its beautiful scenery, fruits and flowers, and is tributary to rich timber lands. It is the seat of the University of Oregon. Pop. 12,000.

Eugenia (ū-jē'ni-a; so named in honor of Prince *Eugene*), a genus of dicotyledonous, polypetalous plants of the nat. order Myrtaceæ, nearly related to the myrtle. It contains numerous species, some of which produce delicious fruits. The allspice of pimento is the berry of the *E. pimenta*. *E. acris* is the wild clove.

Eugenic Acid (ū-jē'nik), or EUGENOL, an acid derived from cloves.

Eugenics (ū-jen'iks). From the word *eugenesis* signifying the quality of breeding well and freely, the word eugenics has recently been derived. It is applied to cover the subject of proper mating in marriage, and attention to the requirements needed to produce healthy and the best quality of offspring. It extends to cover the question of whether the unfit should be permitted to marry or cohabit, and the desirability of legal control of this important subject.

Eugénie (eu-zhā-nē), MARIE DE GUZMAN, Empress of the French, born at Granada, in Spain, in 1826. Her father, the Count de Montijo, was of a noble Spanish family; her mother was of Scotch extraction, maiden name Kirkpatrick. On Jan. 29, 1853, she became the wife of Napoleon III and Empress of the French. On March 16, 1856, a son was born of the marriage. When the war broke out with Germany she was appointed regent (July 27, 1870) during the absence of the emperor, but on September 4 the revolution forced her to flee from France. She went to England, where she was joined by the prince imperial and afterwards by the emperor, Camden House, Chislehurst, became the residence of the imperial exiles. On Jan. 9, 1873, the emperor died, and six years later the prince imperial was slain while with the English army in the Zulu war. In 1881 the empress transferred her residence to Farnborough in Hampshire.

Eugenius (ū-jēn'i-us), the name of four popes.—1. EUGENIUS I, elected on Sept. 8, 654, while his predecessor, Martin I, was still living; died in 657 after an unimportant rule.—2. EUGENIUS II held the see from 824-827.—3. EUGENIUS III, born at Pisa, was a disciple of St. Bernard of Clairvaux. He was raised to the popedom in 1145, was obliged to quit Rome in 1146 in consequence of the commotions caused by Arnold of Brescia; returned by the help of King Roger of Sicily in 1150, and died in 1153.—4. EUGENIUS IV, from Venice, originally called Gabriel Condolmero, was raised to the popedom in 1431. In consequence of his opposition to the council of Basel, an attempt was made to depose him. He died in 1447.

Eugubine Tables (ū'gu-bēn), the name given to seven bronze tablets or tables found in 1444 at the town of Gubbio, the ancient Iguvium or Eugubium, now in the Italian province of Perugia, bearing inscriptions in the language of the ancient Umbrians, which seems to have somewhat resembled the ancient Latin as well as the Oscan. They seem to have been inscribed three or four centuries B.C., and refer to sacrificial usuages and ritual.

Euhemerism (ū-hem'er-izm), or EUEMERISM, a method or system (so named from its founder, Euhemerus, a Greek philosopher) of interpreting myths and mythological deities, by which they are regarded as deifications of dead heroes and poetical exaggerations of real histories.

Eulenspiegel (oi'len-spē-gl), TILL, a name which has become associated in Germany with all sorts of wild, whimsical frolics, and with many amusing stories. Some such popular hero of tradition and folklore seems to have really existed in Germany, probably in the first half of the fourteenth

century, and a collection of popular tales of a frolicsome character, originally written in Low German, purports to contain his adventures. The earliest edition of such is a Strasburg one of the year 1515 in the British Museum. Better known, however, is that of 1519, published also at Strasburg by Thomas Mürner. The work was early translated into English and almost all European tongues.

Euler (oi'lêr or ū'lêr), Leonard, a distinguished mathematician, born at Basel, in 1707, and educated at the University of Basel under the Bernouilli, through whose influence he procured a place in the Academy of St. Petersburg. In 1741 he accepted an invitation from Frederick the Great to become professor of mathematics in the Berlin Academy, but in 1766 returned to St. Petersburg, where he died in 1783, in the office of director of the mathematical class of the academy. Euler's profound and inventive mind gave a new form to the science. He applied the analytical method to mechanics and greatly improved the integral and differential calculus. He also wrote on physics, and employed himself in metaphysical and philosophical speculations. Among his numerous writings are the *Theoria Motuum Planetarum et Cometarum*, *Introductio in Analysin Infinitorum*, *Opuscula Analytica*, etc.

Eumenes (ū'me-nēz), the name of two kings of Pergamus.—1. Eumenes I succeeded his uncle, Philetærus, in B.C. 263. He reigned for twenty-two years and then died in a fit of drunkenness.—2. Eumenes II succeeded his farther, Attalus, B.C. 197, and, like him, attached himself to the Romans, who, as a reward for his services in the war against Antiochus of Syria, bestowed upon him the Thracian Chersonesus and almost all Asia on this side of the Taurus. He died in 159 B.C.

Eumenides (ū-men'i-dez). See *Furies*.

Eunomians (ū-nō'mi-anz), the followers of Eunomius, Bishop of Cyzicum, in the fourth century A.D., who held that Christ was a created being of a nature unlike that of the Father.

Eunuch (ū'nuk), a male of the human species emasculated by castration. The term is of Greek origin (*eunouchos*, from *cunê*, a couch or bed; *echein*, to hold or guard); but eunuchs became known to the Greeks no doubt from the practice among Eastern nations of having them as guardians of their women's apartments. Eunuchs were employed in somewhat similar duties among the Romans in the luxurious times of the empire, and under the Byzantine monarchs they were common. The Mohammedans still have them about their harems. Emasculation, when effected in early life, produces singular changes in males and assimilates them in some respects to women, causing them in particular to have the voice of a female. Hence, not so long ago, it was not uncommon in Italy to castrate boys in order to fit them for soprano singers when grown to manhood.

Euonymus (ū-on'i-mus), the spindle tree or prick-wood, a genus of shrubs or trees, nat. order Celastrineæ, containing about fifty species, natives of the temperate regions of the northern hemisphere. See *Spindle Tree*.

Eupataria, or Eupatoria (ū-pa-tō'ri-a), formerly Kosloff, a seaport in Russia, on the western coast of the Crimea, government of Taurida. It was here that the allied forces landed at the commencement of the Crimean war (September 14-18, 1854). Pop. 18,000.

Eupatorium (ū-pa-tō'ri-um), a genus of plants, chiefly natives of America, belonging to the nat. order Compositæ. Their roots are perennial, possessing a rough, bitter or aromatic taste; the flowers are small, white, reddish of bluish, in corymbs. Among the many species are *E. cannabinum*, or hemp-agrimony, a British plant, and *E. perfoliātum*, thoroughwort or boneset. See *Boneset*.

Eupen (oi'pen), a town in Rhenish Prussia, 7 miles S. S. W. of Aix-la-Chapelle. It has manufactures of woolen and linen cloth, hats, soap, leather and chemicals; paper, flax and worsted mills; and an important trade. The town was ceded to Prussia at the Peace of Paris in 1814. Pop. 14,297.

Euphonium (ū-fō'ni-um), a brass bass instrument, generally introduced into military bands, and frequently met with in the orchestra as a substitute for the bass trombone, from which, however, it is very different in tone. It is tuned on C or B flat, and is furnished with three or four valves or pistons.

Euphorbiaceæ (ū-for-bi-ā'se-e), the spurgeworts, a nat. order of herbaceous plants, shrubs, or very large trees, which occur in all regions of the globe. Most of them have an acrid, milky juice, and diclinous or monœcious flowers. The fruit is dry or slightly fleshy, and three lobed. Among the genera are: *Euphorbia*, which yields an oil used as a powerful cathartic; *Croton*, affording croton-oil; the

Ricinus communis, or castor-oil plant; the *Buxus sempervirens*, or boxwood plant; the *Jatrŏpha Manihot*, which yields the food known as tapioca or cassava. In most members of the genera the milky juice contains caoutchouc. See *Cassava, Castor-oil, Croton, Manchineel, Spurge.*

Euphorbium (ū-for'bi-um), a yellowish-white body which is the solidified juice of certain plants of the genus *Euphorbia*, either exuding naturally or from incisions made in the bark. It is a powerful acrid substance, virulently purgative and emetic.

Euphrasia (ū-frā'si-a). See *Eyebright.*

Euphrates (ū-frā'tēz), or EL FRAT, a celebrated river of Western Asia, in Asiatic Turkey, having a double source in two streams rising in the Anti-Taurus range. Its total length is about 1750 miles, and the area of its basin 260,000 sq. miles. It flows mainly in a southeasterly course through the great alluvial plains of Babylonia and Chaldæa till it falls into the Persian Gulf by several mouths, of which only one in Persian territory is navigable. About 100 miles from its mouth it is joined by the Tigris, when the united streams take the name of Shatt-el-Arab. It is navigable for about 1200 miles, but navigation is somewhat impeded by rapids and shallows. The melting of snow in the Taurus and Anti-Taurus causes a flooding in spring. The water is highest in May and June, when the current, which rarely exceeds 3 miles an hour, rises to 5.

Euphrosyne (ū-froz'i-nē; 'Mirth'), one of the three Graces. See *Graces.*

Euphuism (ū'fū-izm), an affected style of speech which distinguished the conversation and writings of many of the wits of the court of Queen Elizabeth. The name and the style were derived from the *Euphues*, the *Anatomy of Wit* (about 1580), and the *Euphues and his England* (about 1582), of John Lyly.

Eupolis (ū'pō-lis), an Athenian comic poet, who flourished about 429 B.C. Neither the date of his birth nor that of his death is known with certainty. He belongs, like Aristophanes and Cratinus, to the Old Comedy. His works are all lost except small fragments.

Eurasia (ū-rā'si-a), a term applied to Europe and Asia considered as a single continent. Geographically they form but one continent, there being no natural division between the two, Europe being practically a peninsular westward extension of Asia. Yet they are separate historically and ethnographically, and this has led to their being regarded as distinct continents.

Eurasians (ū-rā'si-ans; syncopated from Europ-Asians), a name sometimes given to the 'half-castes' of India, the offspring of European fathers and Indian mothers. They are particularly common in the three presidential capitals—Calcutta, Madras and Bombay. They generally receive an European education, and the young men are often engaged in government or mercantile offices. The girls in spite of their dark tint are generally very pretty and often marry Europeans.

Eure (*eur*), a river of N. W. France, which rises in the department of the Orne, and falls into the Seine after a course of 124 miles, being navigable for about half the distance.—Also the name of a department in the N. W. of France, forming part of Normandy; area, 2330 square miles. The surface consists of an extensive plain, intersected by rivers, chief of which is the Seine. Almost the whole surface is profitably occupied, the waste not amounting to one-thirtieth of the whole. Apples, pears, plums and cherries form important crops, and a little wine is produced. The mining and manufacturing industries are extensive, and the department has a considerable trade in woolen cloth, linen and cotton fabrics, carpets, leather, paper, glass. Evreux is the capital. Pop. (1906) 330,140.

Eure-et-Loir (*eur-ē-lwār*), a department in the N. W. of France, forming part of the old provinces of Orléannais and Ile-de-France; area, 2293 square miles. A ridge of no great height divides the department into a north and a south basin, traversed respectively by the Eure and the Loire. The soil is extremely fertile, and there is scarcely any waste land. A considerable portion is occupied by orchards and vineyards, but the greater part is devoted to cereal crops. The department is essentially agricultural, and has few manufactures. The capital is Chartres. Pop. (1906) 273,823.

Eureka (ū-rē'ka; Gr. *heurēka*, I have found it), the exclamation of Archimedes when, after long study, he discovered a method of detecting the amount of alloy in King Hiero's crown. Hence the word is used as an expression of triumph at a discovery.

Eureka, a city, county seat of Humboldt Co., California, on Humboldt Bay, 5 miles from its entrance. It is surrounded by mountains and forests of

EUROPE
Scale of Miles
0 100 200 400 600
Important towns shown in heavy face type
Longitude East 20° from Greenwich
ARCTIC OCEAN
ATLANTIC OCEAN
NORTH SEA
MEDITERRANEAN SEA
BLACK SEA
BALTIC SEA
BRITISH ISLES
FRANCE
SPAIN
PORTUGAL
GERMANY
AUSTRIA
HUNGARY
SWITZERLAND
ITALY
SERBIA
BULGARIA
RUMANIA
GREECE
TURKEY
RUSSIA
AFRICA
ARCTIC CIRCLE
Strait of Denmark
North C.
Hammerfest
Tromsö
Alexandrovsk
NOVAYA ZEMBLA
KOLGUEV I.
LOFODEN IS.
FARGE IS.
SHETLAND IS.
ORKNEY IS.
HEBRIDES
Bergen
Trondhjem
Stavanger
Christiania
Gothenburg
Helsingfors
Petrograd
Archangel
Kolguev I.
Moscow
Warsaw
Berlin
Vienna
Budapest
Paris
London
Edinburgh
Dublin
Belfast
Liverpool
Manchester
Birmingham
Amsterdam
Brussels
Hamburg
Leipzig
Dresden
Prague
Lemberg
Cracow
Riga
Reval
Libau
Stockholm
Copenhagen
Malmo
Gothland
Aaland Is.
Gulf of Bothnia
Gulf of Finland
Baltic Sea
Lake Ladoga
Lake Onega
White Sea
Kandalaksha
Kem
Onega
Archangel
Kolmas
Skolipa
Ust Syssola
Kotlas
Shenkursk
Totma
Vologda
Nikolsk
Viatka
Perm
Ekaterinburg
Tobolsk
Nizhni Novgorod
Kasan
Vyatka
Vladimir
Saransk
Penza
Syzran
Samara
Orenburg
Ufa
Ural R.
Ural Mts.
Caspian Sea
Aral Sea
Khiva
Astrakhan
Saratov
Tsaritsyn
Rostof
Ekaterinoslav
Kharkof
Kursk
Orel
Yeletz
Voronezh
Kamishin
Tula
Smolensk
Minsk
Bialystok
Brest Litovsk
Chernigof
Kiev
Dnieper R.
Dniester R.
Odessa
Sea of Azof
Sevastopol
Kherson
Nikolaief
Yalta
Caucasus Mts.
Petrovsk
Baku
Batoum
Tiflis
Constantinople
Angora
Smyrna
Konia
Mosul
Damascus
Cyprus
Crete
Sparta
Salonika
Aegean Sea
Rhodes
Malta
Syracuse
Messina
Naples
Rome
Florence
Milan
Venice
Trieste
Fiume
Zagreb
Belgrade
Sarajevo
Bucharest
Varna
Rustchuk
Sofia
Philippopolis
Adrianople
Gallipoli
Dardanelles
Sea of Marmora
Adriatic Sea
Tyrrhenian Sea
Ionian Sea
Sardinia
Corsica
Majorca
Minorca
Balearic Is.
Barcelona
Valencia
Alicante
Malaga
Gibraltar
Cadiz
Str. of Gibraltar
Algiers
Constantine
Tunis
Bastia
Marseilles
Nice
Toulon
Bordeaux
Biarritz
Pau
Toulouse
Nantes
Brest
Cherbourg
Le Havre
Rouen
Calais
Boulogne
Dunkirk
Ostend
Antwerp
Rotterdam
Utrecht
Groningen
Hanover
Bremen
Kiel
Lübeck
Stettin
Danzig
Posen
Breslau
Cologne
Coblenz
Frankfort
Nuremberg
Munich
Augsburg
Innsbruck
Salzburg
Linz
Graz
Klagenfurt
Pola
Ragusa
Cattaro
Durazzo
Scutari
Janina
Larissa
Volo
Patras
Corinth
Athens
Piraeus
Smyrna
Brindisi
Taranto
Palermo
Cagliari
Cosenza
Syracuse
Trapani
Bizerta
Oporto
Lisbon
Coruna
Finisterre
Vigo
Badajoz
Seville
Cadiz
Cordova
Granada
Cartagena
Tortosa
Castellon
Ciudad Real
Toledo
Madrid
Saragossa
Pamplona
Bilbao
Santander
Oviedo
Leon
Valladolid
Burgos
Irun
Bayonne
Perpignan
Montpellier
Lyons
Grenoble
Geneva
Basle
Berne
Zurich
Lucerne
Coire
Bregenz
Constance
Stuttgart
Ulm
Regensburg
Passau
Ingolstadt
Wurzburg
Mannheim
Metz
Nancy
Strasbourg
Belfort
Dijon
Orleans
Tours
Poitiers
Limoges
Clermont
Angers
Rennes
Caen
Dieppe
Amiens
Lille
Arras
Metz
Verdun
Sedan
Reims
Chalons
Troyes
Fontainebleau
Versailles
Rouen
Le Mans
Nantes
Lorient
Brest
Cherbourg
Jersey
Guernsey
Isle of Wight
Portsmouth
Southampton
Plymouth
Falmouth
Land's End
Bristol
Cardiff
Swansea
Holyhead
Liverpool
Manchester
Sheffield
Leeds
Hull
Newcastle
Durham
Carlisle
Glasgow
Greenock
Ayr
Stranraer
Londonderry
Galway
Limerick
Cork
Queenstown
Waterford
Wexford
Dublin
Belfast
Larne
Donaghadee
Portrush
Sligo
Ballina
Killarney
Tralee
Kinsale
Bantry
Skibbereen
Valentia
Dingle
Aran Is.
Clifden
Westport
Achill Is.
Donegal
Lough Swilly
Lough Foyle
Derry
Enniskillen
Omagh
Armagh
Newry
Drogheda
Dundalk
Wicklow
Arklow
Wexford
New Ross
Waterford
Kilkenny
Carlow
Maynooth
Athlone
Roscommon
Castlebar
Ballinrobe
Tuam
Galway
Ennis
Limerick
Tipperary
Cashel
Clonmel
Fermoy
Mallow
Cork
Youghal
Dungarvan
Tramore
Wexford
Gorey
Enniscorthy
Wicklow
Bray
Kingstown
Dublin
Drogheda
Navan
Kells
Mullingar
Longford
Sligo
Boyle
Roscommon
Castlerea
Ballinrobe
Westport
Newport
Castlebar
Ballina
Killala
Belmullet
Achill Is.
Clifden
Galway
Aran Is.

redwood trees and ships large quantities of this lumber to San Francisco. It has lumber and woolen mills, creameries, etc. Pop. 13,500.

Euripides (ū-rip'i-dēz), a celebrated Athenian tragedian, born in B.C., 480, or, according to the Arundel marbles, 485, at Salamis. He studied under Prodicus and Anaxagoras, and is said to have begun to write tragedies at the age of eighteen, although his first published play, the *Peliades*, did not appear until 455 B.C. He was not successful in gaining the first prize till the year 441 B.C., and he continued to exhibit till 408 B.C., when he exhibited the *Orestes*. The violence of unscrupulous enemies, who accused him of impiety and unbelief in the gods, drove Euripides to take refuge at the court of Archelaus, king of Macedonia, where he was held in the highest honor. According to a tradition, he was killed by hounds in 406 B.C. Euripides was a master of tragic situations and pathos, and shows much knowledge of human nature and skill in grouping characters, but his works lack the artistic completeness and the sublime earnestness that characterize Æschylus and Sophocles. Euripides is said to have composed seventy-five, or according to another authority ninety-two, tragedies. Of these, eighteen (or nineteen, including the *Rhesus*) are extant, viz.: *Alcestis*, *Medea*, *Hippolytus*, *Hecuba*, *Heracleidæ*, *Supplices*, *Ion*, *Hercules Furens*, *Andromache*, *Troades*, *Electra*, *Helena*, *Iphigenia in Tauris*, *Orestes*, *Phœnissæ*, *Bacchæ*, *Iphigenia in Aulis* and *Cyclops*.

Euripides.

Euripus (ū-rī'pus), in ancient geography, the strait between the island of Eubœa and Bœotia in Greece.

Euroclydon (ū-rok'li-d o n), a tempestuous wind of the Levant, which was the occasion of the shipwreck of the vessel in which St. Paul sailed, as narrated in Acts, xxvii, 14-44. The northeast wind is the wind evidently meant in the narrative.

Europa (ū-rō'pa), in Greek mythology, the daughter of Agēnor, king of the Phœnicians, and the sister of Cadmus. The fable relates that she was abducted by Jupiter, who for that occasion had assumed the form of a bull, and swam with his prize to the island of Crete. Here Europa bore to him Minos, Sarpēdon and Rhadamanthus.

Europe (ū'r u p), the smallest of the great continents, but the most important in the history of civilization for the last two thousand years. It forms a huge peninsula projecting from Asia, and is bounded on the N. by the Arctic Ocean; on the W. by the Atlantic Ocean; on the S. by the Mediterranean, the Black Sea and the Caucasus range; on the east by the Caspian Sea, the Ural River and the Ural Mountains. The most northerly point on the mainland is Cape Nordkyn, in Lapland, in lat. 71° 6′; the most southerly points are Punta da Tarifa, lat. 36° N., in the Strait of Gibraltar, and Cape Matapan, lat. 36° 17′, which terminates Greece. The most westerly point is Cape Roca in Portugal in lon. 9° 28′ W., while Ekaterinburg is in lon. 60° 36′ E. From Cape Matapan to North Cape is a direct distance of 2400 miles, from Cape St. Vincent to Ekaterinburg, northeast by east, 3400 miles; area of the continent, about 3,800,000 square miles. Great Britain and Ireland, Iceland, Nova Zembla, Corsica, Sardinia, Sicily, Malta, Crete, the Ionian and the Balearic islands are the chief islands of Europe. The shores are very much indented, giving Europe an immense length of coast line (estimated at nearly 50,000 miles). The chief seas or arms of the sea are: the White Sea on the north; the North Sea or German Ocean on the west, from which branches off the great gulf or inland sea known as the Baltic; the English Channel, between England and France; the Mediterranean, communicating with the Atlantic by the Strait of Gibraltar (at one point only 19 miles wide); the Adriatic and Archipelago, branching off from the Mediterranean; and the Black Sea, connected with the Archipelago through the Hellespont, Sea of Marmora and Bosporus.

Surface.—The mountains form several distinct groups or systems of very different geological dates, the loftiest mountain masses being in the south-central region. The Scandinavian mountains in the northwest, to which the great northern peninsula owes its form, extend above 900 miles from the Polar Sea to the south point of Norway. The highest summits are about 8000 feet. The Alps, the highest mountains in Europe (unless Mount Elbruz in the Caucasus is claimed as European), extend from the Mediterranean first in a northerly and then in an easterly direction, and attain their great

est elevation in Mont Blanc (15,781 feet), Monte Rosa, and other summits. Branching off from the Alps, though not geologically connected with them, are the Apennines, which run southeast through Italy, constituting the central ridge of the peninsula. The highest summit is Monte Corno (9541 feet). Mount Vesuvius, the celebrated volcano in the south of the peninsula, is quite distinct from the Apennines. By southeastern extensions the Alps are connected with the Balkan and the Despoto-Dagh of the southeastern peninsula of Europe. Among the mountains of Southwestern Europe are several massive chains, the loftiest summits being in the Pyrenees, and in the Sierra Nevada in the south of the Iberian Peninsula. The highest point in the former, La Maladetta or Mont Maudit, has an elevation of 11,165 feet; Mulahacen, in the latter, is 11,703 feet, and capped by perpetual snow. West and northwest of the Alps are the Cevennes, Jura and Vosges; north and northeast the Harz, the Thüringerwald Mountains, the Fichtelgebirge, the Erzgebirge and Böhmerwaldgebirge. Farther to the east the Carpathian chain encloses the great plain of Hungary, attaining an elevation of 8000 or 8500 feet. The Ural Mountains between Europe and Asia reach the height of 5540 feet. Besides Vesuvius other two volcanoes are Etna in Sicily and Hecla in Iceland. A great part of northern and eastern Europe is level. The *great plain* of North Europe occupies part of France, Western and Northern Belgium, Holland, the northern provinces of Germany and the greater part of Russia. A large portion of this plain, extending through Holland and North Germany, is a low, sandy level not unfrequently protected from inroads of the sea only by means of strong dykes. The other great plains of Europe are the plain of Lombardy (the most fertile district in Europe) and the plain of Hungary. Part of Southern and Southeastern Russia consists of steppes, broad, treeless levels, devoted principally to pasturage.

Rivers and Lakes.—The main European watershed runs in a winding direction from southwest to northeast, its northeastern extremity being of very slight elevation. From the Alps descend some of the largest of the European rivers, the Rhine, the Rhone and the Po, while the Danube, a still greater stream, rises in the Black Forest north of the Alps. The Volga, which enters the Caspian Sea, an inland sheet without outlet, is the longest of European rivers, having a direct length of nearly 1700 miles, or 2400 including windings. Into the Mediterranean flow the Ebro, the Rhone and the Po; into the Black Sea, the Danube, Dnieper, Dniester and Don (through the Sea of Azov); into the Atlantic, the Guadalquivir, the Guadiana, the Tagus and Loire; into the English Channel the Seine; into the North Sea, the Rhine and Elbe; into the Baltic, the Oder, Vistula and Duna; into the Arctic Ocean, the Dwina. The lakes of Europe may be divided into two groups, the southern and the northern. The former run along both sides of the Alps, and among them, on the north side, are the lakes of Geneva, Neuchâtel, Thun, Lucerne, Zürich and Constance; on the south side, Lago Maggiore and the lakes of Como, Lugano, Iseo and Garda. The northern lakes extend across Sweden from west to east, and on the east side of the Baltic a number of lakes, stretching in the same direction across Finland on the borders of Russia, mark the continuation of the line of depression. It is in Russia that the largest European lakes are found—Lakes Ladoga and Onega.

Geology.—The geological features of Europe are exceedingly varied. The older formations prevail in the northern part as compared with the southern half and the middle region. North of the latitude of Edinburgh and Moscow there is very little of the surface of more recent origin than the strata of the Upper Jura belonging to the mesozoic period, and there are vast tracts occupied either by eruptive rocks or one or other of the older sedimentary formations. Denmark and the portions of Germany adjoining belong to the Cretaceous period, as does also a large part of Russia between the Volga and the basin of the Dneiper. Middle and Eastern Germany with Poland and the valley of the Dneiper present on the surface Eocene formations of the tertiary period. The remainder of Europe is remarkable for the great divesity of its superficial structure, rocks and deposits belonging to all periods being found within it, and having for the most part no great superficial extent. Europe possesses abundant stores of those minerals which are of most importance to man, such as coal and iron, Britain being particularly favored in this respect. Coal and iron are also obtained in France, Belgium and Germany. Gold is found to an unimportant extent, and silver is widely spread in small quantities. The richest silver ores are in Norway, Spain, the Erzgebirge and the Harz Mountains. Spain is also rich in quicksilver. Copper ores are abundant in the Ural Mountains, Thuringia, Cornwall

and Spain. Tin ores are found in Cornwall, the Erzgebirge and Brittany.

Climate.—Several circumstances concur to give Europe a climate peculiarly genial, such as its position almost wholly within the temperate zone, and the great extent of its maritime boundaries. Much benefit is also derived from the fact that its shores are exposed to the warm marine currents and warm winds from the southwest, which prevent the formation of ice on most of its northern shores. The eastern portion has a less favorable climate than the western. The extremes of temperature are greater, the summer being hotter and the winter colder, while the lines of equal mean temperature decline south as we go east. The same advantages of mild and genial temperature which western has over eastern Europe the continent collectively has over the rest of the Old World. The diminution of mean temperature, as well as the intensity of the opposite seasons, increases as we go east. Peking, in lat. 40° N., has as severe a winter as St. Petersburg in lat. 60°.

Vegetable Productions.—With respect to the vegetable kingdom Europe may be divided into four zones. The first, or most northern, is that of fir and birch. The birch reaches almost to North Cape; the fir ceases a degree farther south. The cultivation of grain extends farther north than might be supposed. Barley ripens even under the seventieth parallel of north latitude; wheat ceases at 64° in Norway, 62° in Sweden. Within this zone, the southern limit of which extends from lat. 64° in Norway to lat. 62° in Russia, agriculture has little importance, its inhabitants being chiefly occupied with the care of reindeer or cattle, and in fishing. The next zone, which may be called that of the oak and beech, and cereal produce, extends from the limit above mentioned to the 48th parallel. The Alps, though beyond the limit, by reason of their elevation belong to this zone, in the moister parts of which cattle husbandry has been brought to perfection. Next we find the zone of the chestnut and vine, occupying the space between the 48th parallel and the mountain chains of Southern Europe. Here the oak still flourishes, but the pine species become rarer. Rye, which characterizes the preceding zone on the continent, gives way to wheat, and in the southern portion of it to maize also. The fourth zone, comprehending the southern peninsulas, is that of the olive and evergreen woods. The orange flourishes in the southern portion of it, and rice is cultivated in a few spots in Italy and Spain.

Animals.—As regards animals, the reindeer and polar bears are peculiar to the north. In the forests of Lithuania a herd of the European bison is found. Bears and wolves still inhabit the forests and mountains; but, in general, cultivation and population have expelled wild animals. The domesticated animals are nearly the same throughout. The ass and mule lose their size and beauty north of the Pyrenees and Alps. The Mediterranean Sea has many species of fish, but no great fishery; the northern seas, on the other hand, are annually filled with countless shoals of a few species, chiefly the herring, mackerel, cod and salmon.

Inhabitants.—Europe is occupied by several different peoples or races, in many parts now greatly intermingled. The Celts once possessed the west of Europe from the Alps to the British Islands. But the Celtic nationalties were broken by the wave of Roman conquest, and the succeeding invasions of the Germanic tribes completed their political ruin. At the present day the Celtic language is spoken only in the Scotch Highlands (Gaelic), in me parts of Ireland (Irish), in Wales (Cymric), and in Brittany (Armorican). Next to the Celtic comes the Teutonic race, comprehending the Germanic and Scandinavian branches. The former includes the Germans, the Dutch and the English. The Scandinavians are divided into Danes, Swedes and Norwegians. To the east, in general, of the Teutonic race, though sometimes mixed with it, come the Slavonians, that is, the Russians, the Poles, the Czechs or Bohemians, the Servians, Croatians, etc. In the south and southeast of Europe are the Greek and Latin peoples, the latter comprising the Italians, French, Spanish and Portuguese. All the above peoples are regarded as belonging to the Indo-European or Aryan stock. To the Mongolian stock belong the Turks, Finns, Lapps and Magyars or Hungarians, all immigrants into Europe in comparatively recent times. The Basques at the western extremity of the Pyrenees are a people whose affinities have not yet been determined. The total population of Europe is about 330,000,000; nine-tenths speak the languages of the Indo-European family, the Teutonic group numbering about 108,000,000, the Slavonic and Latin over 95,000,000 each. The prevailing religion is the Christian, embracing the Roman Catholic Church, which is the most numerous, the various sects of Protestants (Lutheran, Calvinistic, Angli-

can, Baptist, Methodist, etc.), and the Greek Church. A part of the inhabitants profess the Jewish, a part the Mohammedan religion.

Political Divisions.—The states of Europe, with their respective areas and populations, are as shown below. In addition to those given in the table there are also the insignificant states of Andorra, Monaco and San Marino, which still maintain a kind of precarious independence.

States.	Area in Eng. sq. miles.	Population.	Designation.
Austria-Hungary	261,035	49,418,596	Empire.
Liechtenstein	68	9477	Principality.
Belgium	11,373	7,074,910	Kingdom.
Bulgaria	37,200	4,284,844	Principality.
Denmark	15,388	2,585,660	Kingdom.
Iceland	39,756	78,470	Protectorate.
France	207,054	38,961,945	Republic.
Germany	208,830	64,903,423	Empire.
Britain	11, 121,331	46,094,730	Kingdom.
Greece	25,014	2,433,806	Kingdom.
Netherlands	12,648	5,898,429	Kingdom.
Luxemburg	999	230,543	Grand-duchy.
Italy	110,550	32,475,253	Kingdom.
Montenegro	3,630	228,000	Kingdom.
Portugal	35,490	5,423,132	Republic.
Roumania	50,720	5,912,520	Kingdom.
Russia	1,862,514	125,201,900	Republic.
Servia	18,630	2,493,770	Kingdom.
Spain	194,783	19,503,008	Kingdom.
Sweden	172,876	5,476,441	Kingdom.
Norway	124,129	2,302,698	Kingdom.
Switzerland	15,976	3,741,971	Confederative Republic.
Turkey	65,350	6,130,200	Empire.

History.—Europe was probably first peopled from Asia, but at what date we do not know. The first authentic history begins in Greece at about 776 B.C. Greek civilization was at its most flourishing period about 430 B.C. After Greece came Rome, which, by the early part of the Christian era, had conquered Spain, Greece, Gaul, Helvetia, Germany between the Danube and the Alps, Southern Britain, Illyria, Dacia, etc. Improved laws and superior arts of life spread with the Roman Empire throughout Europe, and the unity of government was also extremely favorable to the extension of Christianity. With the decline of the Roman Empire a great change in the political constitution of Europe was produced by the general migration of the northern nations. The Ostrogoths and Lombards settled in Italy, the Franks in France, the Visigoths in Spain, and the Anglo-Saxons in South Britain, reducing the inhabitants to subjection, or becoming incorporated with them. Under Charlemagne (771-814) a Great Germanic empire was established, so extensive that the kingdoms of France, Germany, Italy, Burgundy, Lorraine and Navarre were afterwards formed out of it. About the time the northern and eastern nations of Europe began to exert an influence in the affairs of Europe. The Slavs, or Slavonians, founded kingdoms in Bohemia, Poland, Russia and the north of Germany; the Magyars appeared in Hungary, and the Normans agitated all Europe, founding kingdoms and principalities in England, France, Sicily and the East. The Crusades and the growth of the Ottoman power are among the principal events which influenced Europe from the twelfth to the fifteenth century. The conquest of Constantinople by the Turks (1453), by driving the learned Greeks from this city, gave a new impulse to letters in Western Europe, which was carried onward by the invention of printing and the Reformation. The discovery of America was followed by the temporary preponderance of Spain in Europe, and next to France. Subsequently Prussia and Russia gradually increased in territory and strength. The French revolution (1789) and the Napoleonic wars had a profound effect on Europe, the dissolution of the old German Empire being one of the results. Since then the most important events in European history have been the establishment of the independence of Greece; the disappearance of Poland as a separate state; the

STORMING THE SCHWABEN REDOUBT

The surrender of the German Front Line as the British swept over the summit. This redoubt was one of the strongest of the German positions occupying the crest north of Thiepval with a full view over the northern valley of the Ancre.

unification of Italy under Victor Emmanuel; the Franco-German war, resulting in the consolidation of Germany into an empire under the leadership of Prussia; and the partial dismemberment of the Turkish Empire.

European War. The great war in Europe, which began in August, 1914, had its ostensible origin in the murder, on June 28, 1914, by a Servian student, of the Archduke Francis Ferdinand, heir to the throne of Austria-Hungary, and his wife, while on a visit to Serajevo, Bosnia. The Austrian Government, on the assumption that Servian officials had instigated this crime, made a series of demands on Servia. These were accepted with one exception, the demand that Austrian officials should take part in the investigation consequent upon the crime. For this Servia suggested arbitration. Austria, upon this, immediately (July 28) declared war on Servia and sent troops against Belgrade, the Servian capital. Russia at once began massing its troops upon the western border. Germany demanded that this should cease, and this ultimatum being refused, declared war upon Russia (August 1). By this date Germany, Austria and France had begun mobilizing. The theatre of war spread with phenomenal rapidity. On August 2 Germany sent troops into Luxemburg, and demanded free passage for its troops through Belgium, which Belgium refused, asking aid from England. On August 3 Germany declared war on France, and on the 4th Britain declared war upon Germany, which had refused to observe Belgian neutrality. On August 5 Austria declared war upon Russia, Belgium upon Germany, and Montenegro upon Austria. On the 10th France declared war on Austria and Montenegro on Germany, and on the 12th Britain declared war upon Austria. On the 23d Japan, which had demanded that Germany should surrender Kiaochow, China, and withdraw its ships from Eastern waters, declared war. Turkey entered the field of war on the side of the central powers on November 4, having previously made an attack on Russian Black Sea ports. As a result, Britain and France declared war on Turkey on November 5. Italy, which had been in alliance with Germany and Austria, had only engaged to assist them in defensive warfare, and decided to remain neutral. She entered the war, however, May 23, 1915, by a declaration of war against Austria.

The first year of the war consisted in the main of three campaigns. (1) Since the French frontier was strongly fortified, Germany undertook the invasion of France by way of Belgium, and about 1,000,000 men were sent in three armies through Belgium, while about the same number were dispatched through Luxemburg, Lorraine and Alsace. The Belgians resisted heroically, but Liège was occupied on August 7. One force under von Kluck moved straight on Brussels, which, being unfortified, yielded without resistance on August 20; a second under von Buelow crossed the Meuse at Huy and advanced upon Namur, which fell on August 22; and a third came through the Ardennes and struck at the line of the Meuse above Namur. Meantime the French had invaded Alsace-Lorraine, were at first successful, but later heavily beaten east of Metz. Other French troops had marched into Belgium to meet with the British the oncoming Germans. At Mons and Charleroi these Allied armies were attacked on August 23 by largely superior German forces, and were driven back day after day until, by September 1, they were again in line from the Vosges to the walls of Paris. All northern France was now in the hands of the Germans, whose armies were in sight of the outer forts of Paris. September 7–10 raged the great battle of the Marne. The Germans at first gained ground, but on September 9 the French line suddenly began a number of terrific attacks which sent the Germans back in complete defeat. The retreating army finally rallied on the line of the Aisne. The Germans established a line from the Oise at Noyon to the Argonne and all Allied efforts to move them failed. The next movement of the Germans was against the Belgian city of Antwerp, which was besieged September 28 and fell on October 9. The German army, worsted in an attempt to reach Paris, then turned its attention to the Channel ports, Calais, Boulogne and Dunkirk, looking toward the conquest of England. Desperate fighting ensued, October 21 to November 15, the Belgians just succeeding in holding the line along the Yser and the British in holding Ypres against three or four times their number. After this the campaign in the west devolved into trench fighting. Belgium and northern France suffered severely from these movements, the city of Louvain in especial being seriously injured, while the famous cathedral of Rheims was badly wrecked by gun fire.

(2) Russia's first efforts were directed against Austria, but the success of Germany in France made necessary Russian intervention against Germany, so that there were two distinct operations. That in East Prussia began on August 17, ended in the great battle of Tannenberg on the 27th, in which von Hindenberg met and

totally defeated the Russians, taking 90,000 prisoners. The Russian forces entered Galicia from the east, attacked and routed the main Austrian armies, driving them through Lemberg and as far as Jaroslav in utter rout. Austria had already been defeated by the Servians at Jedar. Germany now came to her rescue, attempting, under von Hindenburg, a sudden drive at Warsaw (October 1–20) through Central Poland, which was destitute of troops. German troops reached the suburbs of Warsaw, but Russian reinforcements arrived and the invading army was compelled to retreat. Meantime the Russians had renewed their offensive, recrossed the San, reinvested Przemysl, penetrated to the suburbs of Cracow, and even sent raiders over into Hungary. A second German army came to the rescue in November and for days a desperate struggle was carried on about Lodz, but in the end the Russians were again saved by reinforcements and succeeded in getting back beyond the Bzura-Rawka rivers west of Warsaw, repulsing all German attacks. From January 1 to May 1, 1915, the Galician campaign was marked by a slow advance of the Russians toward and through the Carpathians. The fortress of Przemysl, which commanded the main railways and roads of Galicia, fell on March 22. Following this victory the Russian lines were brought to a standstill.

(3) Meantime Germany had opened an offensive. The first movement was directed, during May and June, against the Russian armies entrenched in Galicia behind the Dunajec-Biala rivers. Jaroslav, Przemysl and finally Lemberg were recaptured, and the Russians were driven steadily north into Poland and east toward the Bessarabian frontier. The Russians, lacking ammunition and being heavily outnumbered, were forced to give up all but a narrow strip of the territory they had occupied since September, 1914.

In these movements Russia lost heavily, Germany claiming to have taken 123,000 prisoners and large numbers of guns during the first half of June. The Austro-German forces, said to number 2,000,000 men, advanced steadily into Russian territory, their first important check being on July 8, when the Austrian Archduke Joseph Ferdinand, who had marched too rapidly, was defeated with heavy loss, including 15,000 prisoners. Yet in the months that followed the great drive on the Russians continued. Warsaw was abandoned by the Russians on August 6 without a battle and Kovno and Brest-Litovsk were subsequently yielded to the invaders, but the Russians carried off their munitions from these strongholds and left the country a blackened waste behind them.

September saw the campaign slackening. Along the Dvina, from Riga to Dvinsk, the Russian General Rusky held Von Hindenberg in check, though Vilna was closed in upon and captured September 19. Though the Germans forced back the center of the Russian forces, both flanks were firmly held and in Galicia they drove back the Austrians, taking 40,000 prisoners. In six months Germany had conquered Poland, Courland and Bukovina and recaptured nearly all Galicia; but the Russian army still faced them, and with steadily increasing supplies, while the port of Riga, against which the attack of Von Hindenberg was directed, was firmly held. In October an effort was made to envelop the Russians by a great cavalry drive, but this failed, and the approach of winter found the German advance in this region definitely halted, while the Russian army was steadily growing in numbers and supplies and developing a new staying power. In the west, at the same date, the French and British made vigorous assaults against the German trenches, and in the battles of Lens and Champagne made important though not decisive advances.

While these events were taking place in the north, the war was in considerable part transferred to the south. Since Italy's declaration of war on Austria (May 23, 1915) it had been making vigorous efforts against Trent and Trieste, fighting valorously in the mountain region, but making slow progress. War was also actively prosecuted against Turkey by Anglo-French forces, Constantinople being the goal of their efforts. The first important feature of this was a naval expedition to the Dardanelles in February and March. Several British and French ships were sunk. A large land force was then placed on the Gallipoli Peninsula, but after severe losses, the entire campaign was abandoned. A small British expedition against Turkey, landed at the head of the Persian Gulf, was trapped at Kut-el-Amara and surrendered in April, 1916.

The Balkan Campaign. Servia, against which the war began, had hitherto played a minor part in the great struggle. The original Austrian invasion had ended in failure, though the Servians had suffered severely from an epidemic of typhus fever, about 100,000 perishing before the pestilence was checked. But Servia's share in the war was now to come. In October, 1915, an Austro-German force invaded that country, crossed the Danube on the 10th, took Belgrade and Semindria, and

won Bulgaria as an ally, a Bulgarian army invading Servia on the 11th. The Entente powers in consequence declared war on Bulgaria and French and British troops were landed at the Greek port of Salonika, Greece maintaining its neutrality, yet not opposing this use of its ports. The Anglo-French force, however, met with difficulty, the single line of railway being cut and slow progress being made. In consequence Servia proved incapable of withstanding her invaders, the whole country was overrun, and the Servian army pushed back into Montenegro and Albania by the early days of December. This was followed by an invasion of Montenegro, which continued throughout December, and ended in the fall of Cetinje, the capital, January 13, 1916, the Montenegrin army retreating into Albania. This, with the remnant of the Servian army, estimated in all at from 75,000 to 125,000, was transferred to Salonika, where it joined the army of the Allies.

While the Entente Powers were losing in this field, they were gaining in another, that of Asia Minor. The Grand Duke Nicholas, at the head of a large Russian army, invaded the Armenian country in October, 1915, and after a period of slow progress, reached the city of Erzerum on February 12, 1916, taking it after a three days' bombardment, with many prisoners and 200 guns. Other cities were taken, the principal being the Black Sea port of Trebizond, which fell on April 17, 1916. The result was a general occupation of Armenia, the people of which had suffered terrible outrages and massacres at Turkish hands. Persia was also entered by a Russian force in an effort to reach Bagdad, but this was repulsed after reaching Khanikin, 70 miles from that city.

Meanwhile war continued actively on the mountain frontier of Italy, though with no results of striking importance. On December 25, 1915, an Italian force of 30,000 landed at Avlona, Albania, and on the 29th the port of Durazzo was bombarded, it being taken on January 28, 1916. It was retaken by the Austrians a month later. Avlona, however, remained in Italian hands. On May 15, 1916, an Austrian drive began in the Tyrol, several important positions and numerous prisoners being taken. But activities on the Russian frontier caused a withdrawal of Austrian troops and the Italians retook their lost positions. By mid-July the fighting had again settled down to its former state of nonimportance in results. Meanwhile the Russian advance which had caused the withdrawal of Austrian troops from the Italian front continued actively on a 275-mile front, from the Pripet River to the Rumanian frontier. important gains being made and over 50,000 prisoners taken, while 35,000 more were taken in the capture of the fortress of Dubno. The advance continued until the whole of Bukowina was occupied by the Russians under General Brussiloff and on August 15, 1916, Jablonitz, one of the most important Carpathian passes, was taken. Two interesting events in this period was the appointment of Marshal von Hindenburg to the supreme command of the German and Austrian armies in the East and the declaration of war by Rumania against Austria-Hungary on August 27, 1916. Portugal had entered the war on the side of the Entente Powers on March 9, 1916, so that there were now 14 nations engaged in the great struggle, 10 on the side of the Entente, and 4 on that of the Central Powers.

While the war in the East was making the progress described. it continued with great activity in the West, though here confined to lines established by the operations of the earlier period. The great feature of the struggle in this region was the strenuous effort of the German forces to capture the strong French fortress of Verdun and its equally strenuous defense by the army of France. Here armies amounting to millions in numbers struggled for many months, though the situation was left at the end much as it had been in the beginning. The operations began in a series of violent attacks along nearly the whole western front, probably intended to mislead the French and British commanders in regard to the real object in view. Thus at one time it seemed as if Dunkirk and Calais were the German goal, and later the French were attacked in Champagne. Meanwhile all seemed quiet before the great fortress on the Meuse. On February 23 the storm broke at this point, a powerful German army being suddenly launched against the outlying forts of Verdun. For the time being the German forces seemed apt to succeed in capturing the position but large French reinforcements were brought up and by May it was seen that the French had succeeded in stopping the great German attack and were in control of the situation. The French and British Armies retaliated with a great drive on the line of the Somme beginning July 1, 1916 and lasting through the early months of 1917.

Early in the war the German fleet had been closely blockaded by that of Great Britain, the few cruisers afloat were sunk or interned, and the German colonial ter-

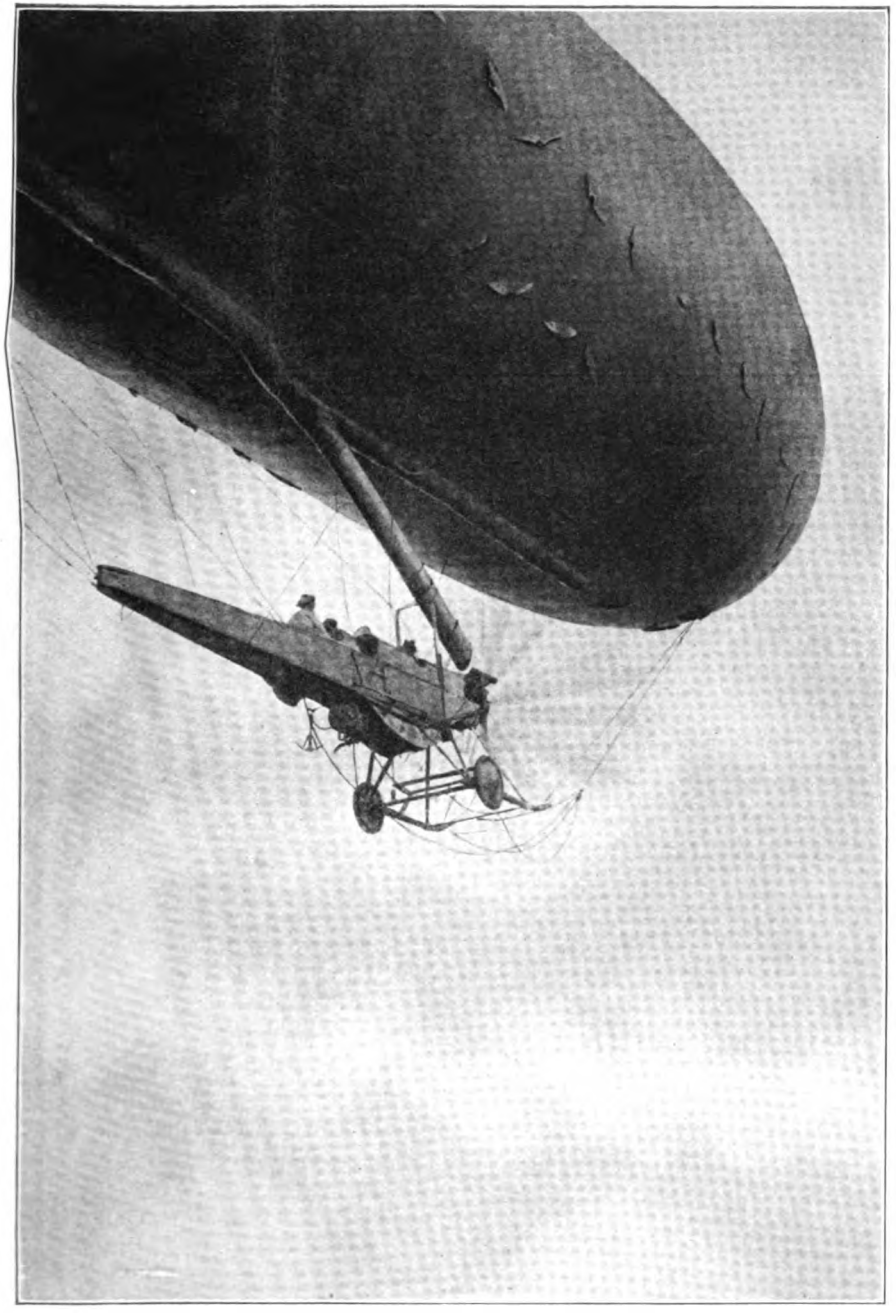
ritory in time fell in large part into the possession of the Entente allies, Japan besieging and capturing Kiaochow and occupying the Caroline and Marshal Islands. Nearly all the German colonies in Africa were captured by the Allied forces by the end of 1916, after hard fighting, but a few still held out.

Naval Operations. Hitherto on the ocean little of importance had taken place. The mastery of the seas was in the hands of the Allies and the powerful fleet of Germany was held in harbor by the much more powerful British fleet. The only effort to break through the British line was made on May 31, 1916, in what Admiral Dewey spoke of as 'the most titanic dash of sea-forces in the history of the world.' This referred to the strength of the fleets engaged, not to the importance of the results. It began in a scouting advance of German light cruisers at 2.30 P. M., while the battleship squadrons sighted each other an hour later and formed into line of battle. The accounts of what followed are rather confused, both sides making unproved claims. What is known is that cruisers and destroyers went down on both sides, the British battle-cruiser *Queen Mary*, hit by a shell, blowing up and sinking at 4.30. Soon after this the German battleship fleet reached the scene and the lighter British vessels withdrew until about 6 P. M., when their own battleship squadron appeared, and these monsters of the seas entered the fight. The accounts of what took place conflict. There were a number of battle cruisers and probably some battleships destroyed, but nothing very definite can be stated at this time. The engagement came to be known as the Battle of Jutland.

Final Events of 1916. Returning to the war on land, we find it marked during the remainder of the year by gains of some importance by the British and French, the latter winning back all the Germans had gained before Verdun and the British occupying German trenches on the Somme. The Italians also were victorious in their advance towards Trieste, though they failed to reach that coveted port. Servia was entered by a force of French and Servian troops and the city of Monastir taken. But the chief importance of the war in this quarter lay in Rumania, which entered the war by an advance through the mountain passes towards Transylvania, but later met with disastrous defeats at the hands of the German forces under General Mackensen. Driven from their mountain stronghold, they were forced back in successive stages, the Danube being crossed by the enemy, Bucharest, their capital city, taken, the province of Dobrudja completely occupied, and their forces hurled back towards the Russian border. Crushed between von Falkenhayn on the Transylvania front, and von Mackensen in the Dobrudja, the country was in dire peril. Russian reinforcements, however, arriving later in October stiffened the Rumanian resistance and enabled them to hold both enemies, and even to drive back a part of the Transylvanian army. A concerted attack by the Allies on the Bulgarian front made considerable headway, but an invasion by the Rumanians into Bulgaria proved a complete failure. At the end of the year they were almost in the state of their Balkan neighbors, Servia and Montenegro, nearly the whole of their country being in the hands of the victorious enemy.

Submarine Operations. The control of the seas by the British navy had enabled the Allies to maintain a blockade very irksome to the Central Powers. During early years of the war they had been able to obtain enormous quantities of supplies of all kinds from neighboring neutral nations, but the Allies by a strict blockade and a careful rationing of the neutrals, according to the average requirements of their own populations, limited their exports to the enemy in large degree. To offset this the Central Powers endeavored to maintain an effectual blockade of the Allies, and of England in particular, by means of their submarines and were to some degree successful.

By 1916 German submarines had reached a high state of development, sinking many vessels belonging to neutral nations as well as belligerents, by torpedoes and shell fire. Notable sinkings were those of the Cunard liner *Lusitania* (*q. v.*) on March 24, 1916, with a loss of 1152 lives, including 114 Americans, and the French steamer *Sussex*, with a heavy loss of life, including many Americans. These attacks brought a sharp warning from the United States government that such attacks must cease, which resulted in a modification of this type of warfare. Six months later, however, on notification from the German government that on February 1, 1917, unrestricted submarine warfare would be renewed, President Wilson broke off diplomatic relations and dismissed the German ambassador on Feb. 3. The subsequent sinking of American vessels by submarines intensified the indignation. Congress was called into session, and on April 6, 1917, the United States entered the great conflict, declaring



SUBMARINE HUNTING

A small naval dirigible used for scouting by the British Navy. Under the cigar-shaped balloon is swung an aeroplane chassis equipped with powerful motors and steering apparatus, together with a light gun.

that a state of war with Germany existed. For the events that followed in this direction see *United States*. Four small countries quickly followed this lead. Cuba and Panama in America, Siam in Asia and Liberia in Africa, joining the allied powers, while two large ones, China and Brazil, later declared war against Germany. Throughout 1916 the Germans were building submarines of much larger type and much greater sea keeping capacity than the earlier boats with which they had carried out their blockade in 1915. These boats contained many improvements (see *Submarine Boats*), which added greatly to their efficiency. These vessels could proceed from their home ports, of which Zeebrugge in Belgium was one of the most important, to favorable points on the great trade routes and attack commerce with the utmost effect. As commerce raiders they were extraordinarily successful as their ability to submerge at will enabled them to escape from warships sent in search of them and even to attack them if any carelessness was shown by the surface craft. The undersea campaign of the Central Powers was met by the Allies in various ways. Troop transports and merchant vessels were sent out in groups heavily convoyed by warships, submarines were hunted down by destroyers and aeroplanes using depth bombs timed to explode at a fixed distance below the surface, nets of steel links were hung in channels frequented by undersea boats, and various devices for detecting their presence were installed on warships and merchantmen, the shipyards of both Allies and neutral nations were called on for the utmost possible production of new ships to replace those lost. In the United States all shipbuilding was placed under the control of the United States Shipping Board and an Emergency Fleet Corporation created to build merchant ships for the government.

Aerial Operations. The aerial warfare of 1917 saw a great increase in biplanes and monoplanes and the almost total elimination of the Zeppelin as a destructive agent. Over a hundred of the "dreadnoughts of the air"—as the huge airships have been styled—visited England on raiding expeditions in 1916. But by the end of 1917 Germany had practically renounced the Zeppelin; armed aeroplanes were relied upon for further raids. As an instance of this, two raids undertaken against England by Germany in December, 1917, consisted solely of aeroplanes; in the first, which occurred early in December, 25 bomb-carrying aeroplanes of the Gotha type were used; in the second, which occurred two weeks later, from 16 to 20 raiding aeroplanes took part. No dirigible balloon can make the speed of an aeroplane, although a super-Zeppelin was constructed, displacing 50 tons and containing 2,000,000 cubic feet of gas and capable of developing a speed of 60 miles an hour. The latest type of heavier-than-air fliers can develop a speed of 130 miles an hour. Bomb-carrying aeroplanes were used by both the Central and Allied Powers for raiding expeditions upon enemy works. It is, however, as 'the eyes of the army' that the aeroplanes have won their place. For scouting purposes, for observation over the enemy's lines, for directing artillery fire they have again and again proved eminently successful. Battles in the air have been of frequent occurrence, some of them taking place above the clouds, 10,000 feet above the entrenched armies on the earth. As an indication of the extensive employment of the heavier-than-air machines in 1917 these figures showing the total number of aeroplanes and seaplanes brought or driven down on the western front in May and September are significant: May, 717; September, 704. During the battle of Malmaison in October and November the French and German aviators fought 611 aerial engagements. The principal aeroplanes used in 1917 were the British Handley-Page and Sopwith, the German Albatros and Gotha, the French Spad, and the Italian Caproni. For observation purposes the kite balloon has been used by all the belligerents. This odd-looking air vessel, with its extra balloon appendix for giving stability, has become a familiar sight on all the battle fronts. Seaplanes also have proved their worth, particularly in the location of submarines. The United States embarked upon an extensive program of aircraft construction immediately upon entering the war, appropriating $640,000,000 for the purpose. The first forces of the United States to land in France for war purposes were the U. S. Naval Aeronautical detachments, which arrived in that country early in June, 1917.

The Situation on the Western Warfront. The early part of 1917 was made especially notable by a number of important battles (see *Battles of Arras, Messines Ridge, Vimy Ridge, and Verdun*), which led to an extensive withdrawal of the German forces to new lines in France and Belgium. The movement began on February 25, the Germans taking advantage of a fog to retire about three miles on the Ancre section and continued during

March over a hundred mile front, the Teuton forces falling back to the 'Hindenburg line,' twenty-five miles in the rear of their former position.

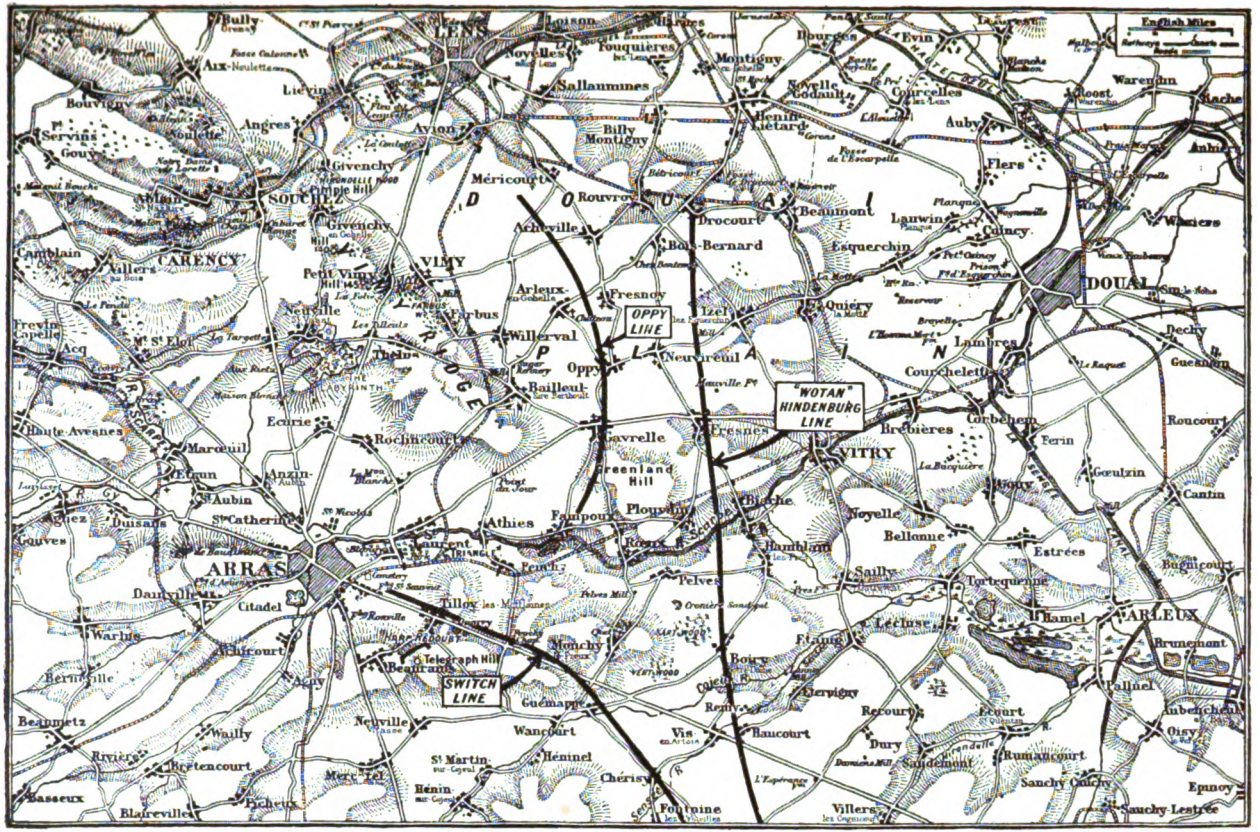
In this retreat the cities of Peronne, Noyons and Nelse were abandoned to the enemy, and in all more than 250 towns and villages, covering 1300 square miles of territory, were given up. In their retreat the Germans left the country behind them completely devastated, buildings being wrecked, farming utensils destroyed and fruit trees cut down, the whole country abandoned being ruined so far as they were able to do so. The territory thus gained by the British through the withdrawal of the enemy was added to by the vigor of their advances during the following months, the immense artillery supply of the British giving them a marked advantage over their foes. On April 6 an advance was made from Arras on a 12-mile front, with the result that the important Vimy-Ridge fell into British hands, while during this and the following day 11.000 prisoners were captured, together with 100 guns and large quantities of supplies.

The French also made a successful drive. During the autumn months new gains were made in western Belgium, much territory and many prisoners being taken, their progress giving them posession of the important ridges of highland overlooking the Flemish plain. This enabled them to overlook the German position and brought them within cannon range of the line of railway supplying the U-boat harbors of Ostend and Zeebrugge while the movements of the French were of less importance, they continued the successful work began at Verdun and received important reinforcements from the United States.

The Political Side of the War. From the beginning of the Great War there were numerous changes in the cabinets of Europe, the system of government obtaining in most of the countries permitting the ousting of premiers and ministers without direct appeal to the people. Thus Herbert H. Asquith, the English premier, resigned on December 5, 1916, and two days later David Lloyd George became Premier and First Lord of the Treasury without an election. Similarly the Italian cabinet headed by Premier Salandra resigned in 1916; and in 1917 the Boselli cabinet was overthrown as a result of the German-Austrian invasion, Prof. Vittorio Orlando becoming Premier of Italy. The French cabinet, with Joseph Caillaux premier, went out in November, 1917, Georges Clemenceau becoming premier. Other war premiers of France were Viviani, Ribot, Painlevé and Briand. In June, 1917, the Zaimis ministry in Greece resigned and ex-Premier Venizelos was authorized by the young king Alexander to form a new ministry. Following a brief revolution in Portugal in December, 1917, came the resignation of the government. In May, 1917, Count Tisza resigned as Premier of Hungary. In Germany Chancellor Von Bethmann-Hollweg had to give place to Dr. Michaelis in July, 1917, and Dr. Michaelis in turn to Count Von Hertling, in November, 1917, Russia was the only one of the important European nations that seemed unable to surmount a crisis by the simple expedient of asking its ministry to resign.

Taking a wide view of the great war it would seem that national greed and national fear divided responsibility for the starting of hostilities. The publication by the Russian Bolsheviki of secret treaties threw a startling light on Europe and laid bare the machinations of diplomats. The war began in the Balkans; Servia feared Austria, for Austria had annexed Bosnia and Herzegovina and was greedy for more; but Servia also had her aspirations, leading to a 'greater Servia,' backed by Russia. The aspirations of Germany in the way of securing 'a place in the sun' were probably limitless; at any rate, they included a Middle Europe, the overlordship of a territory stretching from the North Sea to the Persian Gulf. President Wilson pointed out this menace to the world's peace in one of his state papers. At the beginning of 1918 Germany's boundaries stretched from Flanders to Riga; she controlled practically all of the Balkans, the Middle Europe idea had become an actuality, and there had been no official pronouncement of a peaceful retirement from soil owned by other nations before the war. But also Germany was afraid of Russia, and believed herself menaced by the Entente which existed among the three nations, Russia, France and Great Britain. Russia's millions looked formidable, and Germany feared the loss of her Baltic ports.

The Russian government, under Czar Nicholas, frankly stated that Constantinople was their goal, and Britain officially 'sympathized with this ambition.' But Russia also feared the onward march of the Teuton through Asia Minor and the hurling back of the Slav on the east. France had had experience of Germany's territorial greed in 1870; she was afraid that the Teuton would again attempt to enrich himself at the expense of France. But also France was desirous of retaking Alsace-Lorraine, and, more, as was indicated by the treaties made public in Rus-


LENS
ARRAS
VIMY
SOUCHEZ
CARENCY
DOUAI
OPPY LINE
"WOTAN" HINDENBURG LINE
SWITCH LINE
Telegraph Hill
Greenland Hill
Neuville St Vaast
Thelus
Farbus
Willerval
Arleux
Fresnoy
Izel
Oppy
Roeux
Gavrelle
Fresnes
Vitry
Brebières
Courcelette
Lambres
Corbehem
Ecurie
Rocheincourt
Marœuil
Anzin
St Aubin
St Catherine
Athies
Feuchy
Pelves
Tilloy
Monchy
Beaurains
Wancourt
Héninel
Cherisy
Fontaine
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Ficheux
Blairville
Beaumetz
Wailly
Bretencourt
Baseux
Riviere
Warlus
Dainville
Citadel
Duisans
Gouves
Servins
Bouvigny
Aix-Noulette
Souchez
Givenchy
Camblain
Villers
Mt St Eloi
Acq
Ablain
Angres
Liévin
Avion
Billy Montigny
Méricourt
Rouvroy
Acheville
Bois-Bernard
Procourt
Beaumont
Esquerchin
Lauwin
Cuincy
Flers
Auby
Courcelles
Sallaumines
Noyelles
Fouquières
Montigny
Evin
Warenghin
Roost
Anhiers
Wasiers
Decry
Guesnain
Roucourt
Cantin
Goeulzin
Ferin
Noyelle
Bellonne
Estrées
Sailly
Tortequenne
Bugnicourt
Ramel
FARLEUX
Brunemont
Fallael
Aubencheul
Oisy
Epuncy
Sanchy Lestrée
Sanchy Cauchy
Rumaucourt
Dury
Saudemont
Ecourt
Recourt
Hervigny
Remy
Vis
Baucourt
Villers
Haute-Avesnes
Neuville
Pelves
Bailleul
Willerval
Izel
Quiery
Lambres
Courcelette
Corbehem
Roucourt
Ferin
Goeulzin
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Villers
Fontaine
Cherisy
Héninel
St Martin
Wancourt
Guémappe
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sia, France set the Rhine as her goal. Italy had her 'greater Italy' ambition as well as her fear of 'Mittel Europa.' Roumania had her eyes on Transylvania, Bulgaria on regaining the territory lost in the second Balkan war.

After America's entrance into the war President Wilson declared there could be no peace with Germany so long as the German people continued to allow the militaristic party to remain in power. The first long step toward peace was taken by the Russian people when in December, 1917, representatives of the Bolshevik government met the Central Powers at Brest-Litovsk to arrange for an armistice and a discussion of peace terms.

The Bolshevik formula was 'no annexations and no indemnities.' Nearly all the belligerent governments accepted this formula 'with reservations.' These reservations included, in the case of France, the matter of Alsace-Lorraine; in the case of Italy, the matter of the Trentino; in the case of England, the matter of Palestine and the German colonies; in the case of Japan, the matter of Kiaochow; in the case of Germany, the matter of Riga and Poland and perhaps the retention of a Channel port; in the case of the United States, the matter of the democratization of the government of Germany.

In the last days of 1917, while Russia and the Central Powers were discussing peace, the Radical Party in France held a congress—the first since the war. A section of this group had upheld the idea that France should extend its frontier to the Rhine, but by far the larger section favored the idea of a society of nations, a closer understanding with Socialists around the world, and disarmament. Both wings, however, declared that the return of Alsace-Lorraine must be a condition of peace.

The people of the United States, though no territorial question had entered into their deliberations and they had no thought of adding to their possessions, threw themselves whole-heartedly into the conflict, in the words of the President, 'to make the world safe for democracy.' President Wilson made it clear from the beginning that the quarrel of the American people was not with the German people but with their rulers. The first clash of American and German soldiers occurred November 3, 1917. On December 7, 1917, the United States declared war on Austria-Hungary, the government announcing that Austro-Hungarians in the United States would not be considered as enemy aliens. On December 27, 1917, the U. S. Government took over control of all railroads of the country and announced that they would be operated as a unit under the direction of Secretary of the Treasury McAdoo as Director General of Railroads. See *Railroads.*

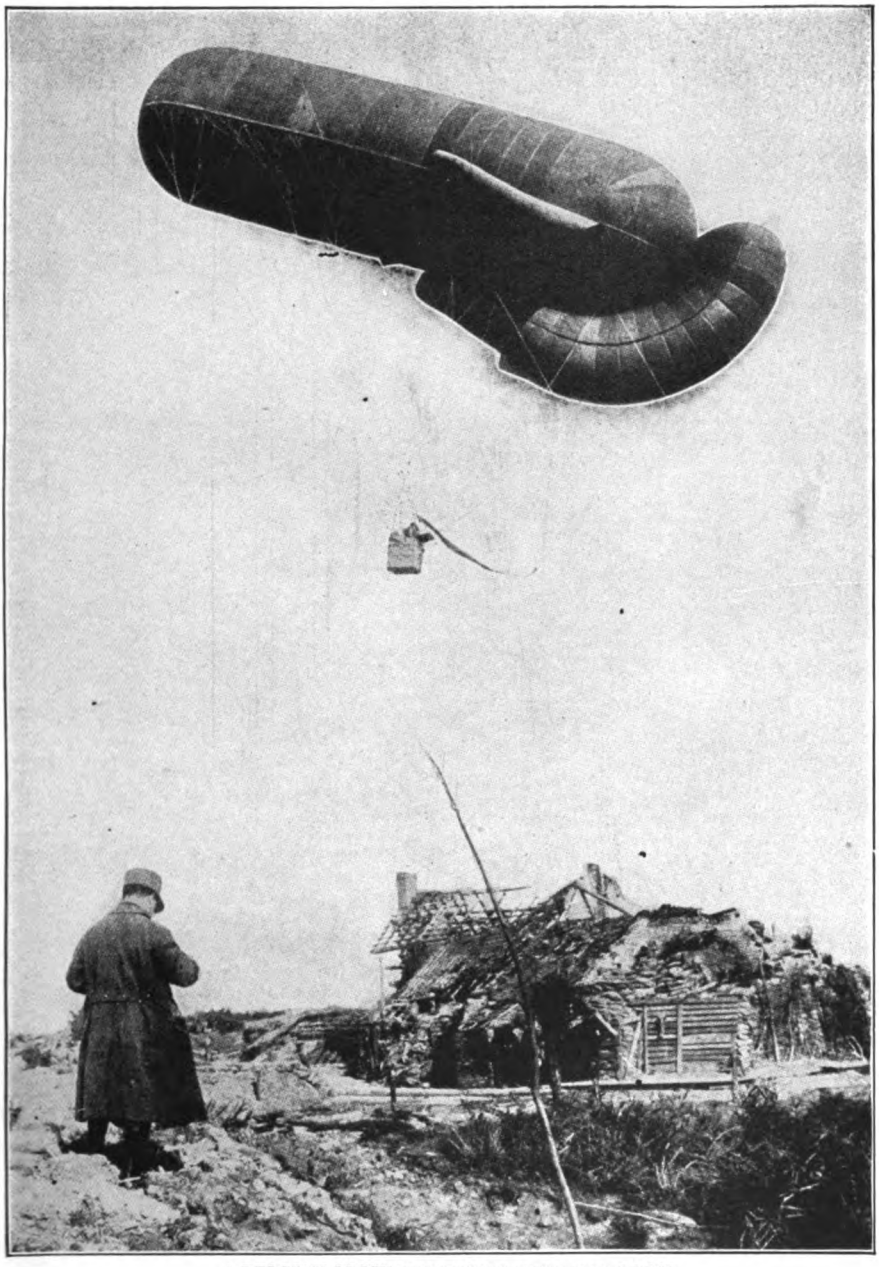
The Latter Half of 1917. In this period British and French alike won notable successes, capturing 55,000 prisoners and over 300 guns in the Flanders advance from August to October. In October General Byng smashed the Hindenburg line from Arras to St. Quentin, capturing 9000 prisoners. At the end of November masses of German infantry were flung recklessly upon the positions won by the British, forcing a withdrawal.

On the Russian and Roumanian fronts Generals Brusiloff and Korniloff for a time achieved success, but the Bolshevik gospel reaching the men in the ranks they threw down their guns and refused to fight. In November Lenine took control of Russian affairs and negotiated an armistice with the Central Allies, resulting eventually in a peace treaty being signed by Russia and Roumania. See *Russia.*

In the southern field the Italians, who had been bravely pressing an offensive on the Isonzo front, met with a severe reverse, being compelled to retire before a powerful thrust of the Austro-Germans begun on October 24. They were forced out of Austrian territory, made to surrender several hundred square miles of Italian soil. British and French troops came to the rescue and a new line was established on the Piave.

Meanwhile the British forces in Mesopotamia had overcome the ill effects of the loss of Kut-el-Amara and its garrison, retaking that place on February 26 and capturing the famous city of Bagdad on March 11, the Turks losing heavily. Progress in this region continued and later in the year Palestine was invested and a victorious advance made, until the British forces captured Jerusalem on Dec. 9, 1917.

Beginning of 1918. After months of preparation the Germans launched their greatest onslaught on the western front on March 21. Regardless of losses they penetrated Allied positions, forcing a retirement of British and French forces to the line they held two years before. It was during this offensive that the Germans bombarded Paris with a gun placed in the Forest of St. Gobain, seventy miles away. The object of the great drive was to divide the British and French forces, but in this they failed. Farther north they attempted to gain Ypres, but though they gained the key position of Mont Kemmel they were unable to advance further, and the second month of the momentous offensive ended with Ypres still in British hands.



A BELGIAN MILITARY OBSERVATION BALLOON

The car of this balloon is equipped with wireless, which is used to send word of the gun positions of the enemy, movements of troops, ranges for the gunners and much other valuable information. A cable holds the balloon captive.

Europhen (ū'ro-fen), a yellow amorphous compound containing 27.6 per cent of iodine. In its action it is similar to iodoform, to which it is preferred by reason of its aromatic odor. In alcohol, chloroform, ether and oils it dissolves freely, but not in water.

Europium (ū-ro'pi-um), a chemical element which occurs in small quantities in the minerals of the 'rare earths.' It requires a complicated series of operations to separate it from the lanthanum, cerium, neodymium, gadolinium, and various elements of the 'rare earth' group with which it is associated. Its oxide Eu_2O_3 is obtained in the form of a powder of a faint pink color.

Eurotium (ū-ro'ti-um), a common mold which grows on a great variety of substances, especially dead herbs, bread, jellies, etc., and is known as the herbarium mold. The generic name used is *Aspergillus*.

Euryale (u-rai'a-lī), a genus of plants of the water-lily family of India and China, with large peltate leaves; the leaf stalks and calyces are covered with stiff prickles. The species *Euryale ferox* is sometimes grown in hothouses. The plant is said to have been in cultivation in China for 3000 years. The seeds are used for food in certain parts of India.

Eurydice (u-rid'i-sē), in Greek mythology, the wife of Orpheus (*q. v.*). She was the daughter of Nereus and Doris. While fleeing from Aristæus she died from the bite of a serpent. Orpheus followed her to the lower world and gained permission to take her back to earth on condition that he would not look behind him. Forgetting his promise he looked back and Eurydice vanished. Consult Vergil's 'Georgics' and Pope's 'Ode on St. Cecilia.'

Eusebius (ū-sē'bi-us), the father of ecclesiastical history, a Greek writer, born in Palestine about 265 A. D., died about 340. About 315 he was appointed Bishop of Cæsarea. He was the most learned man of his age and took an important part in the Council of Nicæa. Among his works are the *Church History*, a *Chronicle*, in two parts, *Martyrs of Palestine*, *Life of Constantine*, *Contra Hieroclem*, *Præpardtio Evangelica*, *Demonstratio Evangelico*, and *Theophania*. The *Præpardtio* is of especial interest as it contains copious extracts from classical writings. He believed he was living at the beginning of a new age and felt impelled to set forth the events leading up to that new era.

Eustachian Tube (ū-stā'ki-an), in anatomy, a canal leading from the pharynx to the tympanum of the ear. See *Ear* and *Eustachio*.

Eustachio (ū-stā'ki-o), BARTOLOMMEO, an Italian physician and anatomist, born soon after 1500; died about 1574. He devoted himself to medical science and in particular to anatomy, which he much enriched by his researches. Among his discoveries were the Eustachian tube (which see) and the Eustachian valve of the fetal heart.

Euterpe (ū-tėr'pē), (1) one of the Muses, considered as presiding over lyric poetry. The invention of the flute is ascribed to her. (2) In botany, a genus of palms, natives of Amboyna and Australia, and an untenable name for *Catis*, a genus of tall palm. See *Assia-palm*.

Euthanasia (ū-than-ā'si-a), an easy death, or a painless method of putting to death. It is often a question whether the use of narcotics or other means of shortening life should not be adopted, in the case of prolonged, painful and hopeless diseases, but such a custom might be open to abuses, and the ordinary medical method is to seek to prolong life to the latest possible moment.

Eutropius (ū-trō'pi-us), FLAVIUS, a Latin historian, who flourished about 360 A.D. His abridgment of the history of Rome (*Breviarium Historiæ Romanæ*) is written in a perspicuous style.

Eutyches (ū'ti-kēz), a Greek heresiarch who lived in the fifth century after Christ. He was superior of a monastery near Constantinople, and his heresy consisted in maintaining that after the incarnation there was only a divine nature in Christ under the appearance of a human body. The doctrines of Eutyches were condemned by the Council of Chalcedon in 451, and he was expelled from his monastery.

Euxine (ūks'in; *Pontus Euxinus*), the ancient name for the Black Sea.

Evangelical (ē-van-jel'i-kel), a term often used to qualify certain theological views, especially strict views on the question of the atonement, justification by faith, the inspiration and authority of the Scriptures, and allied doctrines. In England the so-called Low Church party is evangelical in its views. The 'Evangelical Church' is the official title of the Protestant Church of Prussia, formed in 1817 by the union of Lutherans and Calvinists.

Evangelical Alliance, an association of members of different sections of the Christian church, organized in London in 1846, to lend its influence in favor of evangelical doctrines (see above article), has held conferences at Paris, Berlin, Geneva, New York, London, etc.

Evangelical Association, a body of American Christians, chiefly of German descent, established about the beginning of the last century. In form of government and mode of worship it generally agrees with the Methodist Episcopal Church.

Evangelical Union, the name of a religious sect, also familiarly known as the Morisonians, from the Rev. James Morison, its originator. It took rise in Scotland in 1840, and three years afterwards organized itself as a separate Christian denomination. The Morisonians maintain the universality of the atonement, combining with this the doctrine of eternal personal and unconditional election, and denying that any one will be condemned for Adam's fall. In point of church government the members of the Evangelical Union are independent. The body has about ninety congregations, chiefly in Scotland.

Evangelists (e-van'jel-ists) the writers of the history or doctrines, precepts, actions, life and death of Christ; in particular, the *four evangelists*, Matthew, Mark, Luke and John. The ancient symbols of the four evangelists are: for Matthew, *a man's face;* for Mark, *a lion;* for Luke, *an ox;* and for John, *a flying eagle.*

Evans (ev'ans), Mary Ann. See *Eliot, George.*

Evans, Oliver, born at Newport, Delaware, in 1755, was the inventor of the automatic flour-mill and the high-pressure steam engine, a steam dredge, and the 'Cornish boiler.' He projected a railroad to connect New York and Philadelphia, but lacked the means to build it. He died in New York in 1819.

Evans, Robert Dunglison, naval officer, born in Floyd Co., Virginia, in 1846; was graduated at the U. S. Naval Academy in 1863. He entered the navy during the later years of the Civil war, took part in both attacks on Fort Fisher, and was in command of the *Yorktown*, at Valparaiso, during the Chilean troubles with this country in 1891. His decisive actions here gave him the popular name of 'Fighting Bob Evans.' He took part in the naval fight off Santiago, Cuba, in 1898, as commander of the *Iowa*. He was commissioned rear admiral in 1901, and died in 1912.

Evans, Sir De Lacy, a British general, born at Moig in Ireland in 1787. After some years of service in India he joined the Army of Wellington in the Peninsula in 1812, where he served with distinction. In 1814 he was sent to America, and was present at the battles of Bladensburg and New Orleans, returning to Europe in time to take part in the battle of Waterloo. In 1830, 1831 and 1833 he was elected to parliament. In 1835 he was appointed to the command of 10,000 troops raised in Britain on behalf of the Queen of Spain. Under the training of Evans this force became an excellent army, and several times defeated the Carlists. During the Crimean war he distinguished himself as commander of the second division of the English army, and received the thanks of the House and other honors. He died in 1870.

Evans, Thomas William, a distinguished dentist, born at Philadelphia, Pennsylvania, in 1825. He studied dentistry, and became so expert that he was sent for from France to treat the teeth of Napoleon III. He dwelt in Paris during the remainder of his life, worked for members of all the royal houses of Europe, was loaded with gifts and decorations, and acquired a fortune of several million dollars. He became interested in military sanitation and founded the Red Cross Society. On the night of the revolutionary outbreak in Paris, after the decisive victory of the Germans over Napoleon's army, Sept. 4, 1870, the Empress Eugenie sought shelter in his house and was helped by him to escape to England. He died in 1897, leaving nearly the whole of his fortune to found a museum and dental institute in Philadelphia. Litigation followed, and more than ten years passed before the matter was settled in favor of the terms of his will.

Evanston (ev'anz-ton), a city of Cook County, Illinois, on Lake Michigan, 12 miles N. of Chicago. It is pleasantly situated, and is the seat of the Northwestern University, and other educational institutions. Pop. 24,978.

Evansville (ev'anz-vil), a city, capital of Vanderburg County, Indiana, the second in population in the State. It is situated on the Ohio River, 163 miles E. of St. Louis, and on several railroad lines. It is the center of a large tobacco-growing section and is an important soft-coal and lumber market. There are manufactures of furniture, brooms, buggies, steam shovels, stoves, pottery, cigars, etc. The public buildings include a courthouse, city hall, libraries and art gallery, U. S. marine hospital, etc. It is served by six steam railroads. Pop. 89,105.

Evaporation (e-vap-o-rā'shun), the conversion of a liquid or solid by heat into vapor or steam, which becomes dissipated into the atmos-

phere in the manner of an elastic fluid. The process of evaporation is constantly going on at the surface of the earth, but principally at the surface of the sea, of lakes, rivers and pools. The vapor thus formed, being specifically lighter than atmospheric air, rises to considerable heights above the earth's surface; and afterwards, by a partial condensation, forms clouds, and finally descends in rain.

Evarts (ev'arts), WILLIAM M., an eminent lawyer, born in Boston, Massachusetts, in 1818; was graduated at Yale and studied law at Harvard; began practice in New York about 1840, and subsequently became an active member of the Republican party. In the impeachment trial of President Johnson in 1868 he was his principal counsel, and in 1872 was counsel for the United States in the Alabama Claims arbitration. He served as Secretary of State during the administration of President Hayes and was United States Senator, 1885-91. He died in 1901.

Eveleth (ev'e-leth), a village of St. Louis Co., Minnesota, 71 miles N. N. W. of Duluth. Iron ore is mined here in great quantities. Pop. 7036.

Evelyn (ev'el-in), JOHN, an English writer of the seventeenth century, born at Wotton, in Surrey, in 1620; died there in 1706. After completing his course at Oxford he studied law at the Middle Temple, visited various parts of the continent, and in 1659 took the royal side in the civil war. He published numerous works, among which are *Sculptura, or the History and Art of Chalcography: Sylva, or a Discourse of Forest Trees;* treatises on gardening, architecture, etc. But by far his most important work is his *Memoirs*, comprehending a diary and correspondence, which are interesting contributions to the history of the time.

Evening-primrose, *Œnothēra*, a genus of plants, nat. order Onagraceæ. *Œ. biennis*, an American species common in cottage gardens, is not unfrequent as an escaped plant in England.

Evening-star, or HESPERUS, the name given to the planet Venus when visible in the evening. It is also applied to Jupitar, when similarly visible after sunset.

Everett (ev'er-et), ALEXANDER HILL, an American diplomatist, born at Boston in 1792; died at Canton in 1847. After studying at Harvard, in 1809, he accompanied John Quincy Adams to St. Petersburg as secretary of legation. He afterwards filled successive diplomatic posts in the Netherlands, Spain and elsewhere. He was the author, among other works, of *Europe, or a General Survey of the Present Situation of the Principal Powers* (1822); and a similar work on America.

Everett, EDWARD, an American statesman and author, brother of the preceding, born at Dorchester, Massachusetts, in 1794. After traveling for some years in Germany and England, he returned to America in 1819 to occupy the chair of Greek literature at Harvard. He became editor of the *North American Review*, was prominent as an orator, and entering the political world, became successively member of Congress, governor of Massachusetts and minister plenipotentiary in England (1840). In 1845 he was appointed president of Harvard College, and in 1852 Secretary of State. Shortly after he retired into private life. He died in 1865.

Everett, a city of Middlesex Co., Massachusetts, 3 miles from Boston, on the Boston and Maine R. R. It has manufactures of iron and steel, automobiles, boots and shoes, varnishes, chemicals, etc. Here is a Home School for Young Ladies and the Parlin and Shute Memorial libraries. Pop. 33,484.

Everett, a city, county seat of Snohomish Co., Washington, on Port Gardner Bay, 33 miles N by E. of Seattle. It has important lumber and mining industries, shingle factories, fish canneries, shipyards; also manufactures of bricks, paper, furniture, mills and mining machinery, etc. Pop. 24,814.

Everglades (ev'ĕr-glādş), a low marshy tract of country in Southern Florida, inundated with water and interspersed with patches or portions covered with high grass and trees. They are 160 miles long and 60 broad. Canals for draining them are under construction.

Evergreen (ev'er-grēn), a plant that retains its verdure through all the seasons, as the fir, the holly, the laurel, the cedar, the cypress, the juniper, the holm-oak and many others. Evergreens shed their old leaves in the spring or summer, after the new foliage has been formed, and consequently are verdant through all the winter season. They form a considerable part of the shrubs commonly cultivated in gardens, and are beautiful at all seasons of the year.

Eversion of the Eyelids, or ECTROPION, a disease in which the eyelids are turned outward, so as to expose the red internal

tunic. It occurs most frequently in the lower eyelid.

Evesham (ēvz'am), a town in England, in the county and 15 miles S. E. of Worcester, beautifully situated on the Avon, and giving name to a parliamentary division of the county. It was the seat of a monastery as early as the eighth century. Pop. (1911) 8341.

Eviction (e-vik'shun), the dispossession of a person from the occupancy of lands or tenements. The term occurs most commonly in connection with the proceedings by which a landlord ejects his tenant for non-payment of rent or on determination of the tenancy. In the case of evictions of tenants in Ireland, generally for non-paymet of rent, the tenants are frequently readmitted as caretakers, or under some other title.

Evidence (ev'i-dens) is that which makes certain and which enables the mind to see truth. It may be (*a*) *intuitive*, *i.e.*, resting on the direct testimony of consciousness, of perception or memory, or on fundamental principles of the human intellect; or it may be (*b*) *demonstrative*, *i.e.*, in a strict sense, proofs which establish with certainty as in mathematical science particular conclusions; or it may be (*c*) *probable*, under which class are ranked *moral evidence*, *legal evidence*, and generally every kind of evidence which, though it may be sufficient to satisfy the mind, is not an absolutely certain and incontrovertible demonstration.

In jurisprudence evidence is classified into that which is *direct* and *positive* and that which is *presumptive* and *circumstantial*. The former is that which is proved by some writing containing a positive statement of the facts and binding the party whom it affects; or that which is proved by some witness, who has, or avers himself to have, positive knowledge thereof by means of his senses. Whenever the fact is not so directly and positively established, but is deduced from other facts in evidence, it is *presumptive* and *circumstantial* only. The following are the leading rules regarding evidence in a court of law:—

(1) The point in issue is to be proved by the party who asserts the affirmative. But where one person charges another with a culpable omission this rule will not apply, the person who makes the charge being bound to prove it. (2) The best evidence must be given of which the nature of the thing is capable. (3) Hearsay evidence of a fact is not admissible. The principal exceptions to this rule are—death-bed declarations, evidence in questions of pedigree, public right, custom boundaries, declarations against interest, declarations which accompany the facts or are part of the *res gestæ*, etc. (4) Insane persons and idiots are incompetent to be witnesses. But persons temporarily insane are in their lucid intervals received as witnesses. Children are admissible as witnesses as soon as they have a competent share of understanding and know and feel the nature of an oath and of the obligation to speak the truth.

Evidences of Christianity. These may be divided broadly into two great classes, viz., *external evidences*, or the body of historical testimonies to the Christian revelation; and *internal evidences*, or arguments drawn from the nature of Christianity itself as exhibited in its teachings and effects, in favor of its divine origin. The first Christian apologies—those of Justin Martyr, Minucius Felix and Tertullian, written in the second century—were mainly intended as justifications of the Christian religion against the charges of atheism, immorality, etc., commonly made at that time. Of a more philosophical kind and dealing more comprehensively with the principles of religion and belief in general, are the works of Origen, Arnobius and Augustine in the centuries immediately succeeding. During the middle ages, the scientific representation of Christianity is mostly the work of the schoolmen occupied in welding Aristotelian or Platonic philosophy with the fabric of Christian dogmatics, or writing attacks on the Jewish and Mohammedan faiths.

In the sixteenth and seventeenth centuries the influences of the Renaissance and the Reformation gave rise to a spirit of inquiry and criticism which developed English deism as represented by Herbert and Hobbes in the seventeenth century, and Collins and Bolingbroke in the eighteenth. The general position of English deism was the acceptance of the belief in the existence of God, and the profession of natural religion along with opposition to the mysteries and special claims of Christianity. It was in confutation of this position that the great English works on the evidences of Christianity of Butler, Berkeley and Cudworth were written. In France the new spirit of inquiry was represented by Diderot, D'Holbach, and the encyclopedists in general, who assailed Christianity mainly on the ground that it was founded on imposture and superstition, and maintained by sacerdotal trickery and hypocrisy. No reply

of any great value was produced in the French church, although in the previous age Pascal in his *Pensées* had brought together some of the profoundest considerations yet offered in favor of revealed religion. The nineteenth century was distinguished by the strongly rationalistic spirit of its criticism. The works of such writers as Strauss, Bauer and Feuerbach, attempting to eliminate the supernatural and the mysterious in the origin of Christianity, were answered by the works of Neander, Ebrard and Ullmann on the other side. The historical method of investigation, represented alike by the Hegelian school and the Positivists in philosophy, and by the Evolutionists in science, is the basis of the chief attacks of the present time against the supernatural character of Christianity, the tendency of all being to hold that while Christianity is the highest and most perfect development to which the religious spirit has yet attained, it differs simply in degree of development from any other religion. Notable among later apologists of Christianity have been Paley (*Natural Theology*), Chalmers (*Natural Theology*), Mansel, Liddon and others, Lecturers of the Bampton Foundation; in Germany, Luthardt, Ewald, Baumstark, etc. Its assailants have been equally numerous.

Evil, THE ORIGIN OF, the subject of an appalling quantity of barren speculation. The difficulty of the question lies mainly in this, that the existence of evil in the world seems inconsistent with the view that it was created and is maintained by an omnipotent and beneficent creator. The various theories on the subject have all sought to elude this difficulty either by the supposition of some principle of evil equally eternal with that of good, or by regarding evil as having only a relative existence, being a kind of good in an imperfect and immature stage. Perhaps the oldest theory upon this subject is that of parseeism, or the religion of Zoroaster, according to which there were two original principles, one good (Ormuzd) and the other evil (Ahriman). This is the doctrine that is now very often spoken of as Manichæism, from the fact that it was adopted by Manes, who attempted to engraft it on the doctrine of Christianity. In contradistinction to this dualistic theory with reference to the origin of evil stand the Monistic theories of Brahmanism and Platonism. According to the Brahmanic doctrine of the emanation of all things from one original being (Brahma), this original being was regarded as the sole true existence, and the phenomenal world, with all the evils appearing in it, was held to be mere illusion. Similarly Plato held that the good was the essence of all things, and that the evil and imperfect contained in them had no real existence. The theory enunciated by Leibnitz in his *Theodicée* resembles that of Plato. In that work he assigns to the evil existing in the world created by God, which he holds to be the best of all possible worlds, a merely relative existence; all that we call evil is, he holds, only evil to us because we do not see it in relation to the rest of the universe, for in relation to the universe it is not evil but good, and accordingly cannot be evil in its own nature. Another view on the subject is that which neither assigns to the evil principle (as it does to God or the good principle) an original existence nor denies the real existence of evil, but ascribes it to the exercise of man's free will.

Evil Eye, a power which, according to an old and widespread superstition, resides in some people of doing injury to others by a mere look, or a look accompanied by certain words or charms. This belief, common among the ancients, is still prevalent among the more ignorant classes in Italy, Russia, Andalusia, Turkey, Egypt, the Highlands of Scotland and other places.

Evolute (e v'o-l ût), in geometry, a curve f r o m which another curve, called the *involute* or *evolvent*, is described by the end of a thread gradually wound upon the former, or unwound from it.

Evolution (ev-u-lū'shun), literally the act of unrolling or unfolding, but used as a term in science and philosophy to indicate the development of an organism or organic entity towards greater differentiation of organs and functions, and, therefore, to a more complex and higher state of being. Thus, in astronomy, the nebular hypothesis, which regards the planetary bodies as evolved from nebular or gaseous matter, is an example of evolution. In geology, also, the old view which considered the animal and vegetable life of each geological period as a new and separate organic creation, has given place to the evolutionary theory of a process of development from earlier types to those of the later periods. But the evolution of the more complex from the more simple organisms does not necessarily, probably never does, exhibit a linear series of advances; thus, of the protoplasm which represents the first stage of an animal's existence, part is set aside for one tissue, part for an-

other; in the same way, on the theory of the origin of certain animal or vegetable forms from a common stock, some members of a group have manifested such modifications as render them permanently unlike their kindred of whom some may retain for a longer or shorter time their original characters, while others become specialized in other directions. Evolution is a law whose operation is traceable throughout every department of nature. It may be equally well illustrated from the history of philosophy or the arts, or from the historical development of society. But it is in connection with the evolutionary theory of the origin of species that the principle of evolution has been most discussed, affirming, as it does, that all forms of life both in the animal and vegetable kingdom have been developed by continuous differentiation of organs and modifications of parts from one low form of life consisting of a minute cell. The steps by which this process has been accomplished and the causes which have been mainly at work in it form a department of research to which many notable scientists—Lamarck, St. Hilaire, Meckel, Hæckel, Spencer, Darwin, Wallace and others have contributed. One of the greatest contributions to the theory has been the work of Mr. Darwin (*On the Origin of Species*), in which he has produced some of the strongest evidence in favor of evolution as an endless progression evolving higher species, genera, families, orders, classes, the infinitely varied forms being each adapted to the circumstances by which it is surrounded. See also *Natural Selection*, *Species*.

Evolution, in mathematics, the process of extracting the roots of numbers or quantities.

Evolvent (ē-vol'vent), in mathematics. See *Evolute*.

Evora (ev'ō-ra), a town in Portugal, capital of the province of Alemtejo, 80 miles east of Lisbon. It is an ancient place, poorly built, and its walls, citadel and forts are all in a ruinous state. It has a Roman aqueduct still serviceable, a Gothic cathedral, an ecclesiastical seminary, etc. Pop. 16,-152.

Evremond, or EVREMONT. See *St. Evremond*.

Evreux (ev-rew), a town of N. W. France, capital of the department of Eure, in a fertile valley on the Iton. Although an ancient town with narrow streets, it is well built, has an ancient Gothic cathedral, a town house, two theological seminaries. Pop. (1906) 13,773.

Ewald (ā'vâlt), GEORG HEINRICH AUGUST VON, a German Orientalist and Biblical critic, born at Göttingen in 1803. After studying at the university there, in 1827 he became extraordinary, in 1831 ordinary professor of theology, and in 1835 professor of Oriental languages. In 1837 he lost his chair at Göttingen on account of his protest against the kings' abrogation of the liberal constitution, and became professor of theorogy at Tübingen, but in 1848 returned to his old chair at Göttingen. When Hanover was annexed by Prussia in 1866 he became a zealous defender of the rights of the ex-king. He died at Göttingen in 1875. Among his chief works are the following: *Complete Course of the Hebrew Language; The Poetical Books of the Old Testament; History of the People of Israel; Antiquities of the People of Israel.* The *History* is considered his greatest work.

Ewald (ā'vâlt), JOHANNES, a Danish poet, born at Copenhagen in 1743; died in 1781. After studying theology at Copenhagen University he ran away and enlisted in the Prussian service, which he soon deserted for the Austrian. Having returned to Copenhagen, an elegy which he wrote on the death of Frederick V of Denmark was received with general admiration, and awoke in himself the consciousness of poetic talent. His reputation rapidly increased with the publication of his tragedies, *The Death of Balder*, *Adam and Eve*, *Rolfkrage*, etc.; and his odes and songs.

Ewald, JOHN, a Danish general, born at Cassel in 1744; died in 1813; said to have been a brother of the preceding. He fought for the United States in the Revolutionary war, entered the Danish service in 1788, rose to the rank of general, and distinguished himself in defense of the neutrality of Denmark about 1806. He wrote an able treatise, *Instructions in War*.

Ewing (ū'ing), THOMAS, an American statesman, born in Ohio Co., Virginia, in 1789; died in 1871. He became prominent in politics and in 1831 and again in 1850 was elected to the United States Senate. In 1841 he was appointed Secretary of the Treasury, in 1849 was made the first secretary of the Interior. Retiring from the Senate in 1851, he devoted himself to legal practice in Lancaster, Ohio.

Exarchate (egz-ärk'āt), a name of a province or territory under an *exarch*, or viceroy. In the sixth century after Christ Justinian formed the middle part of Italy into a province of the Eastern Empire, and gave the

government of it to an officer called an *exarch*. Exarch was also the title of an ecclesiastical grade in the Greek Church. Among the modern Greeks an *exarch* is a deputy of the patriarch.

Excalibur (eks-kal'i-bur), the famous sword of the mythical King Arthur. The story goes that it was sunk deep in a great stone, from which it could be drawn only by the man who was destined to be king.

Excavation, the process of removing rock or earth for the purpose of engineering construction, or of clearing the space for the foundations of a building. Where rock is encountered it must first be shattered by the use of explosives placed in holes drilled for the purpose. Some form of mechanical excavator is usually employed. This may be a steam shovel (which see) or a machine resembling a dredge, with a series of buckets running on an endless chain. The latter is suitable only for shallow cuttings.

Excelsior (eks-sel'si-or), the trade name of a fine quality of wood shavings, used in packing perishable goods and for stuffing mattresses, cushions, etc. The fibers are separated from wood blocks by an excelsior machine, which is a form of vertical planer using reciprocating cutters driven at high speed.

Exchange (eks-chanj'), a place in large commercial towns where merchants, agents, bankers, brokers and others concerned in commercial affairs meet at certain times for the transaction of business. See *Stock Exchange.*

Exchange, in commerce, that species of transactions by which the debts of individuals residing at a distance are canceled by order, draft, or bill of exchange, without the transmission of specie. Thus, a merchant in New York who owes $1000 worth of goods in London, gives a bill or order for that amount which can be negotiated through banking agencies or otherwise against similar debts owing by other parties in London who have payments to make in New York. This obviates the expense and risk of transmitting money. The process of liquidating obligations between different nations is carried on in the same way by an exchange of foreign bills. When all the accounts of one country correspond in value with those of another, the exchange between the countries will be *at par*, that is, the sum for which the bill is drawn in the one country will be the exact value of it in the other. Exchange is said to be *at par* when, for instance, a bill drawn in New York for the payment of $1000 in London can be purchased there for $1000. If it can be purchased for less, exchange is *under par* and is against London. If the purchaser is obliged to give more, exchange is *above par* and in favor of London. Although the thousand circumstances which incessantly affect the state of debt and credit prevent the ordinary course of exchange from being almost ever precisely at par, its fluctuations are confined within narrow limits, and if direct exchange is unfavorable between two countries this can often be obviated by the interposition of bills drawn on other countries where an opposite state of matters prevails. See also *Bill of Exchange.*

Exchange, DEED OF, an original common law conveyance for the mutual transfer of real estate. It takes place between two contracting parties only, although several individuals may be included in each party; and the parties must take an equal estate, as fee-simple for fee-simple, legal estate for legal estate, copyhold for copyhold of the same manor, and the like.

Exchequer (eks-chek'ér), in Britain, the department which deals with the moneys received and paid on behalf of the public services of the country. The public revenues are paid into the Bank of England (or of Ireland) to account of the exchequer, and these receipts as well as the necessary payments for the public service are under the supervision of an important official called the Controller and Auditor General, the payments being granted by him on receipt of the proper orders proceeding through the treasury. The public accounts are also audited in his department.

Exchequer, CHANCELLOR OF THE. See *Chancellor.*

Exchequer, COURT OF, an ancient English court of record, established by William the Conqueror, and intended principally for the care and collection of the royal revenues. It was one of the supreme courts of common law, and is said to derive its name from the checkered cloth, resembling a chessboard, on which the sums were marked and scored with counters. The judges of this court were the chief baron and five junior or *puisné* barons. This court has been merged in the High Court of Justice. In Canada there is a Court of Exchequer for the Dominion.

Exchequer Bills, bills of credit issued by authority of the British Parliament as a means of raising money for temporary purposes.

They are of various sums—£100 or any multiple of £100—and bear interest (generally from 1½*d.* to 2½*d. per diem* on £100) according to a rate fixed at the beginning of each year. These bills pass from hand to hand as money, and form a principal part of the public unfunded debt of Great Britain. *Exchequer bonds* are similar, but they run for a definite number of years at a fixed rate of interest.

Excise (ek-sīz'), an inland duty or impost laid on commodities produced and consumed within a country, and also on licenses to manufacture and deal in certain commodities. Excise duties were introduced into England by the Long Parliament in 1643, being then laid on the makers and vendors of ale, beer, cider and perry. Being a convenient and productive source of revenue, they gained ground, and now furnish about two-sevenths of the public revenue. In the United States the term Internal Revenue is employed (which see).

Excitomotor Action, the action of nerves distributed to muscular organs, the stimulation of which leads to movement. Thus, irritation of a nerve supplying a muscle will lead to contraction of the muscle by excitomotor action, and irritation of certain nerves distributed to blood-vessels will lead to contraction of the vessel by acting on its muscular coat.

Excommunication (ek s-ko-mū-ni-kā'shun), the exclusion of a Christian from the communion and spiritual privileges of the church. Excommunication was practiced early by the Christian Church. A distinction gradually arose between a lesser and a greater excommunication, the former being a suspension from church privileges, the latter a formal expulsion excluding from all communion with the faithful. In the middle ages the popes often excommunicated whole cities and kingdoms. In such a case all religious services ceased and the grave inconveniences thus caused made excommunication a formidable weapon in the hands of the pope, till with frequent abuse it lost its force. Besides excommunication an extreme degree of denunciation called *anathema*, and cutting the offender off from all the hopes and consolations of the Christian faith, is used in the Roman Catholic Church. In the Church of England both the less and the greater excommunication are recognized.

Excretion (eks-krē'shun), in physiology, the separation and carrying off of waste matter from an animal body, a function performed by the lungs, kidneys, bladder and the skin, besides the action of the intestinal canal.

Excubitorium (e k s-ku-bi-tō'ri-um), in mediæval churches, a gallery where public watch was kept at night on the eve of some festival, and from which the great shrines could be seen.

Exe (eks), a river of England, which rises in Exmoor, in the county of Somerset, and after a southerly course of about 50 miles falls into the English Channel at Exmouth.

Execution (ek-se-kū'shun), in law, is a judicial writ grounded on a judgment of the court by which the writ is issued, and is granted for the purpose of carrying the judgment into effect, by having it executed. Execution is granted by a court only upon the judgments given by the same court, not upon those pronounced by another.

Execution, the carrying out of the punishment of death. See *Capital Punishment.*

Executioner (ek-se-kū'shun-er), the official who carries into effect a sentence of death, or inflicts capital punishment in pursuance of a legal warrant. This duty devolves upon the sheriff in England and the United States.

Executive (ekz-ek'ū-tiv), that branch of the government of a country by which the laws are carried into effect or the enforcement of them superintended. The term is used in distinction from the *legislative* and the *judicial* departments, and includes the supreme magistrate, whether emperor, king, president or governor, his cabinet or ministers, and a host of minor officials.

Executor (ekz-ek'ū-tor), in law, is one appointed by a man's last will to carry its provisions into execution after the testator's death. The testator may, by the common law, appoint any person of sound mind and discretion, though otherwise under some legal disabilities as to contracting and transacting business in general, such as a married woman or a minor. The duties of executors and of administrators are, in general, the same, the difference of the two depending mostly on the mode of appointment, the executor being nominated by the testator, the administrator being appointed by the judge of probate. An executor is liable for any loss occurring to the estate through negligence for paying legatees before all debts are discharged.

Exegesis (eks-e-jē'sis), the exposition or interpretation of the Scriptures. The science which lays down the principles of the art of sacred interpretation is called *exegetics* or *hermeneutics*.

Exequatur (ek-se-kwā'tur; Lat. 'Let him accomplish'), a written recognition of a consul or commercial agent issued by the government to which he is accredited, and authorizing him to exercise his powers.

Exergue (egz-ėrg'), the small space beneath the base line of a subject engraved on a coin or medal, left for the date, engraver's name, or something of minor importance.

Exeter (eks'ē-tėr), a city and river-port, of England, in the county of Devon, on the left bank of the Exe, 10 miles northwest from its outlet in the English Channel. It is pleasantly situated on the summit and slopes of an acclivity rising from the river, and has handsome squares, terraces and streets. Among the objects of interest are the cathedral (founded 1112), the remains of the castle of Rougemont, the Guildhall, the Albert Memorial Museum, St. Michael's Church, etc. Exeter has iron foundries, manufactories of agricultural implements, paper-mills, etc., and 'Honiton' lace is also made. By means of a canal vessels of 300 tons can reach the city. The largest vessels remain at Exmouth. Exeter is a place of remote antiquity, having been a British settlement long prior to the invasion of the Romans, by whom it was called *Isca Damnoniorum*. Pop. 48,660.

Exfoliation (eks-fō-li-ā'shun), in surgery, the process by which a thin layer or scale of dead bone separates from the sound part.

Exhibition, INDUSTRIAL, an exhibition of works of industry and art for the purpose of exciting public interest and promoting trade and manufactures. In 1798 an industrial exhibition of the products of French industry was held at Paris, and proved so successful that in 1802, during the consulate of Napoleon, another was held. The beneficial effects of these exhibitions were so obvious that a series of them was held at intervals, the eleventh and last thing held at Paris in 1849. In Britain exhibitions of a more or less local nature had been held in Dublin (1829), Manchester, Liverpool and Birmingham, and annually in London on the premises of the Society of Arts. The first on an international scale was the Crystal Palace Exhibition in Hyde Park, London, opened May 1, 1851. It covered an area of about 19 acres and attracted 15,000 exhibitors. An International Exhibition, on a small scale, was held at New York in 1853, and in 1855 the first French Exposition Universelle was opened in Paris. The buildings were erected in the Champs Elysées, and covered about 24 acres. This was followed by the national exhibitions of the Dutch at Haarlem and the Belgians at Brussels, both in 1861, and the following year by the second great international exhibition held in London. The building erected at South Kensington, covered about 17 acres. In 1865 an exhibition was held at Dublin, which, successful in other respects, was a pecuniary failure. The second French International Exhibition was opened on April 1, 1867, and closed on the 3d of November. It was erected on the Champ de Mars, and covered about 37 acres. The exhibitors numbered nearly 50,000, the visitors about 10,000,000. In 1871, the first of a series of British annual international exhibitions of fine arts and industry was opened in London, and continued through 1872, 1873 and 1874, but proved unsuccessful. In 1873 the first Austrian international exhibition was held in Vienna. In the United States, a great exhibition was held at Philadelphia in 1876 upon the occasion of the centennial festival of the American declaration of independence. It occupied 60 acres, and had nearly 10,000,000 visitors. A third French International Exhibition was held at Paris in 1878, the area occupied amounting in all to 140 acres, the visitors numbering about 17,000,000. A fourth was held in 1889, the latter being partly intended to commemorate the centenary of the French Revolution. One of its permanent features is the famous Eiffel Tower of iron, 984 feet high. In 1893 an International Exhibition of large proportions was held in Chicago, Illinois, to commemorate the 400th anniversary of the discovery of America. It occupied about 600 acres, the total admissions being over 27,000,000. The French held a great International Exposition at Paris in 1900, which, in the number of admissions, was far in excess of any similar affair. The Pan-American Exposition, Buffalo, New York, in 1901, was unique in its striking electrical display, and was made especially notable by the assassination of President McKinley while visiting it. The centenary of the Louisiana purchase was commemorated by a magnificent exhibition, on the grandest scale, at St. Louis in 1904. Many smaller exhibitions have been held in

the United States, including in recent years those commemorating the Lewis and Clarke exploration at Portland, Oregon, in 1905, the tricentenary of the settlement of Jamestown, Virginia, by one at Norfolk, in 1907, and the expansion of the Pacific States, by one at Seattle, Washington, in 1909. The Panama Pacific Exposition of 1915 (which see) surpassed all previous industrial exhibitions.

Exile (eks'il), originally banishment from one's native country by the compulsion of authority; now prolonged absence from one's country either enforced or undergone voluntarily.

Exmouth (eks'mouth), a town of England, in Devonshire, 10 miles S. S. E. of Exeter, at the mouth of the Exe. It is picturesquely situated, and is one of the handsomest sea-bathing places on the Devonshire coast. The chief industries are lacemaking and the fisheries. Pop. (1911) 11,963.

Exmouth, EDWARD PELLEW, VISCOUNT, a British naval officer, born in 1757; died in 1833. He went to sea at the age of thirteen, served as midshipman in the *Blonde* frigate during the American war, and greatly distinguished himself at Lake Champlain. In 1782 he was made a post-captain for a brilliant action in the *Pelican*, and on the outbreak of the war in 1793 was appointed to the command of the frigate *La Nymphe*. From this time till the peace in 1802 he was employed in active service. In 1804, on the resumption of hostilities, he was sent to take the chief command on the East India station, in the *Culloden*, of seventy-four guns; and here he remained till 1809, when he had attained the rank of vice-admiral. His next appointment was the command of the fleet blockading the Scheldt. In 1816 he proceeded to Algiers in command of a combined fleet of twenty-five English and Dutch ships to enforce the terms of a treaty regarding the abolition of Christian slavery which the dey had violated. He bombarded the city for seven hours, and inflicted such damage that the dey consented to every demand. Twelve hundred Christian slaves were freed.

Exocetus (eks-ō-sē'tus), EXOCŒTUS. See *Flying-fish*.

Exodus (eks'o-dus; Greek, *exodos*, a going out), the name given in the Septuagint to the second book of the Pentateuch, because it describes the departure of the Israelites from Egypt. The contents of the book are partly historical, describing the departure of the Israelites from Egypt, and partly legislative, describing the promulgation of the Sinaitic law. One of the difficulties connected with this book is that, according to Scriptural chronology, the residence of the Israelites in Egypt was only 215 years, and it seems incredible that in this time 'the threescore and ten souls' who accompanied Jacob to Egypt could have become the two and a half millions who left with Moses.

Exogenous Plants (eks-oj'e-nus), or EXOGENS, those plants whose stems are formed by successive additions to the outside. The exogens are the largest primary class of plants in the vegetable kingdom, and their increase by annual additions of new layers to the outside of their stems, formed in the cambium between the wood

EXOGENOUS PLANTS.

1. Section of a Branch of three years' growth. *a*, Medulla or pith. *b*. Medullary sheath. *e e*. Medullary rays. *c c*, Circles of annual growth. *d*, Bark. 2, Netted veined Leaf of Exogen (Oak). 3. Dicotyledonous Seed of Exogen. *a a*, Cotyledons. 4. Germination of Dicotyledonous Seed. *a a*, Seed leaves or Cotyledons. *o*, Plumula. 5, Exogenous Flowers (Crowfoot).

and the bark, is a feature in which they differ essentially from endogens, whose wood is formed by successive augmentations from the inside. The concentric circles thus annually formed, distinguishable even in the oldest trees, aid in computing the age of the tree. The stem and branches also exhibit a central pith and medullary rays extending outwards to the bark. All the trees of cold climates, and the principal part of those in hot, are exogenous, and are readily distinguished from those that are endogenous by the reticulated venation of their leaves, and by their seeds having two cotyledons (dicotyledonous). The parts of the flower are generally in fours or fives.

Exorcism (eks'or-sizm), the casting out of evil spirits by certain forms of words or ceremonies. An opinion prevailed in the ancient church that certain persons, those particularly

who were afflicted with certain diseases, especially madness and epilepsy, were possessed by evil spirits. Over such persons forms of conjuration were pronounced, and this act was called *exorcism*. There were even certain men who made this a regular profession, and were called *exorcists*. Exorcism still makes a part of the beliefs of some churches. In the Roman Catholic Church exorcist is one of the inferior orders of the clergy.

Exosmose (eks'os-mōs), the opposite of *endosmose* (which see).

Exostemma (eks-os-tem'a), a genus of plants, nat. order Cinchonaceæ. The species are trees or shrubs, natives of tropical America and the West Indies. *E. caribœum* and *E. floribunda* possess properties similar to those of the true cinchona, but without any trace of either cinchonine or quinine.

Exostosis (eks-os-tō'sis), in surgery, a bony excrescence or growth from one of the bony structures of the body. It is generally found at the end of long bones near the joints, and in connection with the skull. Amputation is generally required.

Exotic (eks-ot'ik), belonging to foreign countries; a term used especially of plants. Exotic plants are such as belong to a soil and climate entirely different from the place where they are raised. They are nearly always greenhouse or hothouse plants.

Expansion (eks-pan'shun), in physics, is the enlargement or increase in the bulk of bodies, in consequence of a change in their temperature. This is one of the most general effects of heat, being common to all bodies whatever, whether solid or fluid. The expansion of fluids varies considerably, but, in general, the denser the fluid, the less the expansion; thus, water expands more than mercury, and spirits of wine more than water; and, commonly, the greater the heat, the greater the expansion; but this is not universal, for there are cases in which expansion is produced, not by an increase, but by a diminution of temperature. Water, in cooling, ceases to contract at 42° F.; and at about 39°, just before it reaches the freezing point (32°), it begins to expand again, and more and more rapidly as the freezing point is reached. This expansion is about one-eleventh of its bulk, and accounts for the bursting of pipes, etc., when water is freezing in them.

Expectation (eks-pek-tā'shun), in the doctrine of chances, the value of any prospect of prize or property depending upon the happening of some uncertain event. A sum of money in *expectation* upon a certain event has a determinate value before that event happens. If the chances of receiving or not receiving a hundred pounds, when an event arrives, are equal; then, before the arrival of the event the expectation is worth half the money.—*Expectation of life*, the probable duration of the life of individuals of any given age. A rough estimate of any one's expectation of life is made by calculating two-thirds of the difference between his or her present age and eighty.

Expectorants (eks-pek'tor-ants), in pharmacy, medicines which favor the discharge of mucus from the windpipe and air-passages of the lungs. Such are the stimulating gums and resins, squills, ipecacuanha, etc.

Experiment (eks-per'i-ment), an operation designed to discover some unknown truth, principle or effect, or to establish it when discovered. It differs from observation in the fact that the phenomena observed are, to a greater or less extent, controlled by human agency. Experiment distinguishes the modern method of investigating nature, and to it we owe the rapid strides made in chemistry, physics, etc.

Expert (eks-pert'), a person eminently skilled in any particular branch or profession; specifically a scientific or professional witness who gives evidence on matters connected with his profession, as an analytical chemist or a person skilled in handwriting.

Exploits (eks-plofts'), River of, a river which traverses nearly the whole of Newfoundland from S. W. to N. E. and falls into the Bay of Exploits. It is about 150 miles long, and is navigable for steamers 12 miles.

Explosion (eks-plō'zhun), a sudden disruption, generally due to the rapid production of gaseous matter from solids or liquids. Thus, the explosion of gunpowder is due to the sudden formation and expansion of gases into which the powder is converted by chemical agency. Explosions are often caused by the elastic force of steam confined in boilers, etc.

Explosives (eks-plō'sivz) are compounds practically available in war, in mining, and in general use for the sudden development of immense force. They comprise gunpowder, guncotton, nitroglycerine with its compounds dynamite, lithofracteur, and a large number of others, many of them of extraordinary power.

Exponent (eks-pō'nent), in algebra, the number or figure which, placed above a root at the right hand, denotes how often that root is repeated or how many multiplications are necessary to produce the power. Thus, a^2 denotes the second power of the root *a*, that is *a*, multiplied by *a*; a^4 denotes the fourth power. The figure is the *exponent* or index of the power. To express the roots of quantities fractional exponents are used:

thus $a^{\frac{1}{2}}$, $a^{\frac{1}{3}}$, $a^{\frac{1}{n}}$, denote the square root, the cubic root and the *nth* root of *a*.

Ex Post Facto (eks post fak'tō), in law, by something done after and bearing upon something previously done; thus, a law is said to be *ex post facto*, or retrospective, when it is enacted to punish an offense committed before the passing of the law. There is a provision in the Constitution of the United States that 'no ex post facto law shall be passed.' This has been interpreted to refer only to crimes, and in that sense the phrase is commonly used.

Express (eks-pres'), a special message, messenger or conveyance, sent on a particular occasion. The name is given to any regular provision made for the speedy transmission of messages, parcel, commission, and the like; and particularly to a railway train which travel at a specially high rate of speed, stopping only at the principal stations.

Expressed Oils (eks-prest'), in chemistry, are those which are obtainable from bodies only by pressing, to distinguish them from mineral and essential oils, which last are, for the most part, obtained by distillation.

Extension (eks-ten'shun). (1) In physics and metaphysics that property of a body by which it occupies a portion of space. Extension is an essential as well as a general property of matter, for it is impossible to form a conception of matter, however minute may be the particle, without connecting with it the idea of its having a certain bulk and occupying a certain quantity of space. Every body, however small, must have length, breadth and thickness; that is, it must possess the property of extension. Figure or form is the result of extension, for we cannot conceive that a body has length, breadth and thickness without its having some kind of figure, however irregular. (2) In logic, *extension* is the extent of the application of a general term, that is, the objects collectively which are included under it; thus, the word figure is more extensive than triangle, circle, parallelogram, etc.; European more extensive than French, Frenchman, German, etc. Matter and mind are the most extensive terms of which any definite conception can be formed. Extension is contrasted with *comprehension* or *intension*.

Extincteur (eks-tan-*teur*), an apparatus for the extinction of fire, consisting of a metallic case containing water, and materials for generating carbonic acid. When required the materials are brought into contact by pushing a rod which breaks a bottle containing acid, the gas mixes with the water, and the pressure generated is sufficient to project the water charged with the gas to a distance of 40 or 50 feet.

Extract (eks'trakt), a term to denote all that can be dissolved out of a substance by a specified menstruum, such as water, alcohol, ether, etc. In modern pharmacy the term is applied to two kinds of preparation from vegetables. One is obtained by digesting the plant in water or other solvent, and evaporating or distilling away the excess of solvent until the extracted matter is sufficiently inspissated. The other is got by bruising the plant in a mortar, separating the juice, warming it until the green coloring matter separates, and filtering it off. The juice is next heated until the albumen coagulates, and again filtered. The juice is now evaporated to a syrup, the green coloring matter added and well mixed, and the evaporation is thereafter continued until the required concentration is attained. Extracts must be capable of being redissolved, so as to form a solution like that from which they were derived. Extracts are used in cookery, medicine and the manufacture of perfumery.—*Extract of Meat* (*extractum carnis*) is a soft, yellowish-brown, solid or very thick syrup, which is employed as a portable soup. It is now manufactured on the large scale by processes proposed by Liebig.

Extradition (eks-tra-dish'un), the act by which a person accused of a crime is given up by the government in whose territories he has taken refuge to the government of which he is a subject. Treaties have been entered into by the United States with almost all civilized countries for the apprehension and extradition of persons charged with particular offenses, such as murder, robbery, embezzlement by public officers, arson, rape, piracy, etc. The Constitution of the United States provides that 'a person charged in any state with treason, felony or other crime, who shall flee from justice and be found in another

state, shall, on demand of the executive authority of the state from which he fled, be delivered up to be removed to the state having jurisdiction of the crime.'

Extravaganza (eks-trav-a-gan'za), in music, the drama, etc., a species of composition designed to produce effect by its wild irregularity and incoherence; differing from a burlesque in being an original composition and not a mere travesty.

Extravasation (eks-trav-a-sā'shun), an escape of some fluid, as blood or urine, from the vessel containing it. *Blood extravasation*, in contusions and other accidents, is when blood-vessels are ruptured by the injury, and the blood finds its way into the neighboring tissues. In some accidents to the urethra and bladder extravasation of urine is a very serious occurrence.

Extreme Unction (eks'trēm ungk'-shun) is, resting on Scripture authority, one of the seven sacraments of the Catholic Church. It is performed in cases of mortal disease by anointing in the form of a cross, the eyes, ears, nose, mouth, hands, feet and reins (in the case of males). It is administered after confession and the eucharist, and is believed to remove the last stains of sin. It can only be administered by a bishop or priest, and is not applied in the case of young children or excommunicated persons.

Extremities (eks-trem'i-tēz), the limbs, as distinguishing them from the other divisions of the animal, the head and trunk. The extremities are four in number, in man named upper and lower; in other animals anterior and posterior.

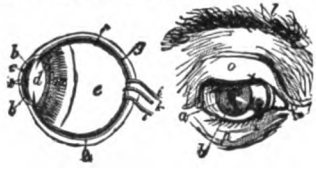
Exuma (eks-ū'ma), GREAT and LITTLE, two of the Bahama Islands. The former is 30 miles long and 3 miles wide, and has a good harbor. Pop. 2300.

Exuviæ (eks-ū'vi-ē), the cast-off parts or coverings of animals, as the skins of serpents and caterpillars, the shells of lobsters, etc.

Eyalet (ī'a-let), a former administrative division of the Turkish empire, subdivided into sanjaks or provinces, and kazas or districts. It was ruled by a pasha, and gave place to the vilayet on the reorganization of the empire in 1871.

Eyck (īk), HUBERT and JAN VAN, brothers, famous painters of the old Flemish school, born at Maaseyck, Hubert in 1366, Jan probably about 1390. They lived first at Bruges, whence the younger brother is called John of Bruges, and afterwards at Ghent, to which they removed about 1420. Here they executed the celebrated *Adoration of the Lamb* for the cathedral of Ghent, a painting which, in its different parts, contains above three hundred figures, and is a masterpiece. It was in two horizontal divisions, comprising ten panels, of which only the two central ones remain at Ghent, the others being at Berlin. Hubert did not live to see it completed. He died at Ghent (1426), as did also his sister Margaret, who was likewise a painter (1431). Jan finished the work in 1432, and returned to Bruges, where he remained till his death, which took place in 1411, and executed several excellent pieces. His reputation became very great even during his lifetime, by his share in the introduction of oil-painting, the original invention of which has been incorrectly ascribed to him by many. Jan van Eyck also introduced improvements in linear and aerial perspective, and in painting upon glass.

Eye (ī), the visual apparatus of animals, consisting in man of the globe of the eye, the muscles which move it, and of its appendages, which are the eyelids and eyebrows, and the lachrymal apparatus. The walls of the globe of the eye are formed principally of two fibrous membranes one white and opaque—the *sclerotic* (Gr. *sklēros*, hard)—which



HUMAN EYE.

Interior. *a*, Pupil. *b*, Iris. *c*, Cornea. *d*, Crystalline lens. *e*, Vitreous humor. *f*, Retina. *g*, Choroid coat. *h*, Sclerotic coat. *i i*, Central vein of the retina. *k*, Optic nerve. *m*, Ciliary processes. *n*, Ciliary ligament or circle. Exterior. *l*, Eyebrow. *o p*, Upper and lower eyelid. *x x*, Eyelashes. The pupil and iris are also shown at *a* and *b* respectively.

envelops two-thirds of the globe posteriorly; and the other transparent, and resembling a horny plate, whence its name, *cornea* (Lat. *corneus*, horny). The sclerotic is a tough, fibrous coat, and is the part to which the phrase 'white of the eye' is applied. In the front of the globe the sclerotic is abruptly transformed into the transparent portion (the cornea), which is circular, and which forms a window through which one can see into the interior. A mucous membrane, the *conjunctiva*, so named because it unites the eye to the lid, spreads over the ante-

rior portion of the globe, and then folds back on itself and lines the internal surface of the eyelids. On the internal surface of the sclerotic is a vascular membrane called the *choroid*. This is essentially the blood-vessel coat of the eyeball. The front part of the choroid terminates about the place where the sclerotic passes into the cornea in a series of ridges, the *ciliary processes*. The circular space thus left in front by the termination of the choroid is occupied by the *iris*, a round curtain, the structure seen through the cornea, differently colored in different individuals. In its center is a round hole, the *pupil*, which appears as if it were a black spot. The *iris* forms a sort of transverse partition dividing the cavity of the eyeball into two chambers, a small anterior chamber filled with the *aqueous humor*, and a large posterior chamber filled with *vitreous humor*. The *iris* consists of a framework of connective tissue, and its posterior surface is lined by cells containing pigment which gives the color to the eye. In its substance are bundles of involuntary muscular fibers, one set being arranged in a ring around the margin of the pupil, the other set radiating from the pupil like the spokes of a wheel. In a bright light the circular fibers contract and the pupil is made smaller, but in the dark these fibers relax and cause the pupil to dilate more or less widely, thus allowing only that quantity of luminous rays to enter the eye which is necessary to vision. Just behind the pupil is the *crystalline lens*, resembling a small, very strongly magnifying glass, convex on each side, though more so behind. The greater or less convexity of the surfaces of the lens determines whether the vision is long or short. The internal surface of the choroid, or rather the pigmentary layer which covers it, is lined by the *retina* or nervous tunic upon which the objects are depicted that we see. It appears to be formed by the expansion of the optic nerve, which enters the eye at its posterior part about one-tenth of an inch to the inner side of the axis of the eyeball, and forms at the bottom of the globe an enlargement, which is called the *papilla of the optic nerve*. Microscopists describe the retina as being composed of five, or even eight layers, of which the internal one is vascular and in contact with the vitreous; the external one, very important in a physiological point of view, is the *membrane of Jacob*. It is composed of cones and cylinders or *rods*, joined together like the stakes of a palisade, perpendicular to the plane of the membrane, and forming by their free extremities a mosiac, each microscopic division of which is about 0.001 of a line in diameter according to Robin, and 0.0008 of a line according to Helmoltz; and represents a section of a rod. These rods and cones are believed to be the agents by whose aid the waves of light become transformed into the stimulus of a sensation. The ocular globe is put in motion in the orbit by six muscles, grouped two by two, which raise or lower the eye, turn it inward or outward, or on its antero-posterior axis. In these movements the center of the globe is immovable, and the eye moves round its transverse and vertical diameters. These three orders of movements are independent of each other, and may be made singly or in combination, in such a manner as to direct the pupil towards all points of the circumference of the orbit. Each eye is furnished with two eyelids, moved by muscles, which shield it from too much light and keep it from being injured. They are fringed with short, fine hairs called eyelashes; and along the edge of the lids is a row of glands similar to the sebaceous glands of the skin. The eybrows, ridges of thickened integument and muscle, situated on the upper circumference of the orbit and covered with short hairs, also regulate to some extent the admission of light by muscular contraction. In reptiles, some fishes (sharks, etc.), in birds, and in some mammals a third eyelid, or nictitating membrane, is present, and can be drawn over the surface of the eye so as to clear it of foreign matters, and also to modify the light. The lachrymal apparatus is composed of, first, the *lachrymal gland*, which lies in a depression of the orbital arch; secondly, of the *lachrymal canals*, by which the tears are poured out upon the conjunctiva a little above the border of the upper lid; thirdly, the *lachrymal ducts*, which are destined to receive the tears after they have bathed the eye, and of which the orifices or *lachrymal points* are seen near the internal commissure of the lids; fourthly, the *lachrymal sac*, in which the lachrymal ducts terminate, and which empties the tears into the *lachrymo-nasal canal*. The tears, by running over the surface of the conjunctiva, render it supple and facilitate the movements of the globe and eyelids by loosening the friction. The influence of moral or physical causes increases their secretion, and when the lachrymal ducts do not suffice to carry them off they run over the lids.

Vision.—The retina renders the eye

sensible of light, and we may therefore consider it as the essential organ of vision. The function of the other portions is to converge the luminous rays to a focus on the surface of the retina, a condition necessary for distinct vision and the clear perception of objects. The visual impressions are transmitted from the retina to the brain by means of the optic nerve, of which that membrane appears to be the expansion. The two optic nerves converge from the base of the orbit toward the center of the base of the skull, where there is an interlacement of their fibers in such a manner that a portion of the right nerve goes to the left side of the brain, and a part of the left nerve to the right side; this is called the *chiasma* or *commissure* of the optic nerves. The principal advantage of having two eyes is in the estimation of distance and the perception of relief. In order to see a point as single by two eyes we must make its two images fall on corresponding points of the retinas; and this implies a greater or less convergence of the optic axes according as the object is nearer or more remote. To accommodate the eye to different distances the lens is capable of altering itself with great precision and rapidity. When we look at a near object the anterior surface of the lens bulges forward, becoming more convex the nearer the object; the more distant the object the more the lens is flattened. When the transparency of the cornea, the crystalline lens, or any of the humors, is destroyed, either partially or entirely, then will partial or total blindness follow, since no image can be formed upon the retina; but although all the humors and the cornea be perfectly transparent, and retain their proper forms, which is likewise necessary to distinct vision, yet, from weakness or inactivity of the optic nerves, or injury of the central ganglia with which it is connected, weakness of sight or total blindness may ensue. Defective vision may also arise from the crystalline lens being so convex as to form an image before the rays reach the retina (a defect known as short sight or myopia), in which case distinct vision will be procured by interposing a concave lens between the eye and the object of such a curvature as shall cause the rays that pass through the crystalline lens to meet on the retina; or the lens may be too flat, as is the case in old age; a defect which is corrected by convex lenses. In the lower forms of life the organs of sight appear as mere pigment spots. Ascending higher, simple lenses or refracting bodies occur. Insects, crustaceans, etc., have large masses of simple eyes or ocelli aggregated together to form compound eyes—the separate facets or lenses being optically distinct, and sometimes numbering many thousands. In the molluscs well-developed eyes approaching in structure those of the highest animals are found; and in all vertebrate animals the organ of vision corresponds generally to what has been described, though they vary much in structure and adaptation to the surroundings of the animal.

Eye, in agriculture and gardening, signifies a bud or shoot of a plant or tuber.

Eye (ā), a municipal borough, England, County Suffolk, 19 miles north of Ipswich. Up till 1885 it sent a member to Parliament, and it still gives name to a parl. division of the county. Pop. 2000.

Eyebright (i'brit; *Euphrasia officinālis*), a small plant belonging to the nat. order Scrophulariaceæ, which is common in Britain and most parts of Europe, in North Asia, etc. It is annual, from 3 to 8 inches high, often much branched. The whole plant has a bitter taste. Under the name of *euphrasy* it formerly enjoyed a great reputation in diseases of the eyes.

Eyelid (i'lid). See *Eye.*

Eyemouth (i'mouth), a fishing town of Berwickshire, Scotland, at the mouth of the Eye, an important place in the thirteenth century. Pop. 2436.

Eyepiece, in a telescope, microscope, or other optical instrument, the lens, or combination of lenses to which the eye is applied.

Eylau (i'lou), a small town, about 28 miles distant from Königsberg, in Prussia, famous for a bloody battle fought between Napoleon and the allied Russians and Prussians, on the 7th and 8th of February, 1807. Both sides claimed the victory. The loss of the allies was about 20,000 men, while that of the French must have been considerably greater.

Eyre (ār), Edward John, an Australian explorer and colonial governor, born in Yorkshire, England, in 1815. He went to Australia in 1833, in 1839 discovered Lake Torrens, and in 1840 explored its eastern shores and the adjacent Flinders Range. He then commenced his perilous journey along the shores of the Great Australian Bight, and reached King George's Sound, in Western Australia, a distance of 1200 miles, with a single native boy, having

left Adelaide more than a year before. In 1845 he published *Discoveries in Central Australia*. After filling several governorships he was appointed governor of Jamaica in 1862. In 1865 he was confronted with a negro rebellion which he crushed with some severity, and was recalled. On his return to England John Stuart Mill and others took measures to try him for murder, but failed. Carlyle was one of his most strenuous defenders. He died in 1900.

Eyre, LAKE, a large salt-water lake of South Australia. Area about 4000 sq. miles, but it is subject to great fluctuations in size.

Ezekiel (ē-zē'ki-el; 'God shall strengthen'), the third of the great prophets, a priest, and the son of Buzi. He was carried away when young (about 599 B.C.) into the Babylonish captivity. His prophetic career extended over a period of 22 years, from the 5th to the 27th year of the captivity. The Book of Ezekiel contains predictions made before the fall of Jerusalem, in 586 B.C. (chaps. i-xxiv), prophecies against some of the neighboring tribes (chaps. xxv-xxxii), prophecies concerning the future of Israel (xxxiii-xxxix), and a series of visions relating to the circumstances of the people after the restoration.

Ezra (ez'ra), a celebrated Jewish scribe and priest. Under his guidance the second expedition of the Jews set out from Babylon to Palestine under the reign of Artaxerxes I, about 458 B.C. The important services rendered by Ezra to his countrymen on that occasion, and also in arranging and in some measure, it is believed, settling the canon of Scripture, are especially acknowledged by the Jews, and he has even been regarded as the second founder of the nation. Josephus states that he died in Jerusalem; others assert that he returned to Babylon and died there at the age of 120 years. The *Book of Ezra* contains an account of the favors bestowed upon the Jews by the Persian monarchs, the rebuilding of the temple, Ezra's mission to Jerusalem, and the various regulations and forms introduced by him. It is written partly in Hebrew and partly in Chaldee, which has led some to conclude that it is the work of different hands.

F

F, the sixth letter of the English alphabet, is a labio-dental articulation, formed by the passage of breath between the lower lip and the upper front teeth. It is classed as a surd spirant, its corresponding sonant spirant being *v*, which is distinguished from *f* by being pronounced with voice instead of breath, as may be perceived by pronouncing *ef, ev.* (In *if, of,* however, *f* is=*v.*) The figure of the letter F is the same as that of the ancient Greek digamma, which it also closely resembles in power.

F, in music, is the fourth note of the diatonic scale.

Fa (fä), the name given by Guido to the fourth note of the natural diatonic scale of C.

Faam-tea or Faham-tea (fa'am), a name given to the dried leaves of the *Angræcum fragrans*, an orchid growing in the Mauritius and in India, and much prized for the fragrance of its leaves, an infusion of which is used as a stomachic and as an expectorant in pulmonary complaints.

Faber (fā'ber), FREDERICK WILLIAM, a theologian and hymn-writer, the nephew of George Stanley Faber, born at Durham in 1814. In 1845 he became a convert to Roman Catholicism, and founded the oratory of St. Philip Neri, afterwards transferred to Brompton. He died in 1863.

Faber, GEORGE STANLEY, an English popular theological writer, born in 1773, near Bradford in Yorkshire. He was educated at Oxford, and became a fellow of Lincoln College. He was appointed Bampton Lecturer in 1801; became a prebend in Salisbury Cathedral in 1831, and master of Sherburn Hospital, Durham, in 1832. He died in 1854. Amongst his principal writings are *Horæ Mosaicæ*, *The Doctrine of Regeneration*, and *A Dissertation on the Prophecies.*

Fabii (fā'bi-ī), an ancient and renowned family of Rome, who, having undertaken the duty of defending Roman territory against the incursions of the Veientines, established themselves at a post on the river Cremera. Being drawn into an ambush, they were killed to a man (B.C. 477). A boy who happened to be left in Rome became the second founder of the family. Among its celebrated members in aftertimes was FABIUS MAXIMUS, whose policy of defensive warfare was so successful against Hannibal in the Second Punic war (B.C. 218-202); and FABIUS PICTOR, who lived about the same time and wrote a history of Rome, thus being the earliest Roman historian.

Fable (fā'bl), in literature, a term applied originally to every imaginative tale, but confined in modern use to short stories, either in prose or verse, in which animals and sometimes inanimate things are feigned to act and speak with human interests and passions for the purpose of inculcating a moral lesson in a pleasant and pointed manner. The fable consists properly of two parts —the symbolical representation and the application, or the instruction intended to be deduced from it, which latter is called the *moral* of the tale, and must be apparent in the fable itself. The oldest fables are supposed to be the oriental; among these the Indian fables of Pilpay or Bidpai, and the fables of the Arabian Lokman, are celebrated. (See *Bidpai* and *Lokman.*) Amongst the Greeks Æsop is the master of a simple but very effective style of fable. The fables of Phædrus are a second-rate Latin version of those of Æsop. In modern times Gellert and Lessing among the Germans, Gay among the English, the Spanish Yriarte, and the Russian Ivan Kriloff are celebrated. The first place, however, amongst modern fabulists belongs to the French writer La Fontaine. See *La Fontaine.*

Fabliaux (fab'li-ō), in French literature, the short metrical tales of the Trouvères, or early poets of the Langue d'Oil, composed for the most part in the 12th and 13th centuries. These productions were intended merely for recitation, not for singing, and had as their principal subjects the current gossip and news of the day, which were treated in a witty and sarcastic way.

The fabliaux lashed not only the clergy and nobility in their degeneracy, but even mocked the religious spirit.

Fabre (fäbr) JEAN HENRI, a French scientist, born at Saint-Léons, Aveyron, December 21, 1823. He was a schoolmaster and professor of natural philosophy at the College of Ajaccio and the Lycée of Avignon. His books, including *The Mason Bees*, *The Life of the Spider*, and *The Life and Love of the Insect*, show the most minute and sympathetic observation of the habits of insects. He died October 11, 1915.

Fabriano (fä-brē-ä'nō), an episcopal city of Italy, province of Ancona. Pop. 9586.

Fabricius (fa-bris'h'e-us), CAIUS (with the cognomen LUSCINUS), a pattern of Roman virtue. After having conquered the Samnites and Lucanians, and enriched his country with the spoils, of which he alone took nothing, he was sent on an embassy to Pyrrhus, king of Epirus, who tried in vain to corrupt him by large presents. In 275 B.C. Fabricius was chosen censor. He died about 250 B.C.

Fabricius (fa-brit'se-us), JOHANN ALBRECHT, a German scholar, born at Leipzig in 1668, became professor of rhetoric and moral philosophy at Hamburg, and published many learned works, among which are his *Bibliotheca Latina*, *Bibliotheca Ecclesiastica*, and *Bibliotheca Antiquaria*. He died in 1736.

Fabricius (fä-brit'se-us), JOHANN CHRISTIAN, a Danish entomologist, born in 1745; died in 1808. After studying at Copenhagen, Leyden, Edinburgh, and under Linnæus at Upsala, he obtained the post of professor of natural history in the University of Kiel. In 1775 appeared his *System of Entomology*, which gave to this science an entirely new form. In 1778 he published his *Philosophia Entomologica*, written upon the plan of the well-known *Philosophia Botanica* of Linnæus.

Façade (fa-säd' or fa-säd'), the face, front view, or principal elevation of a building. It usually contains the principal entrance.

Facciolati (fät-cho-lä'tē), JACOPO, an Italian classical scholar, born in 1682; died in 1769; professor in the University of Padua. The most important work with which he was connected was the *Totius Latinitātis Lexicon*, compiled by Forcellini under his direction and with his coöperation.

Face (fās), the front part of the head, the seat of the most of the senses. The bony basis of the face, exclusive of the thirty-two teeth (these not being in the strict sense bones), is composed of fourteen bones, called, in anatomy, the *bones of the face*. The anterior part of the skull (*os frontis*) also forms an important feature of the face. Of all these bones the lower jaw only is movable, being articulated with the base of the skull. The other bones are firmly joined together and incapable of motion. In brutes the jaws project much more than in men, and form the prominent feature of the face, while the forehead recedes. (See *Facial Angle*.) The face of birds comprehends the ophthalmic regions, cheeks, temples, forehead and vertex; the face of insects includes all between the proboscis and the prothorax.

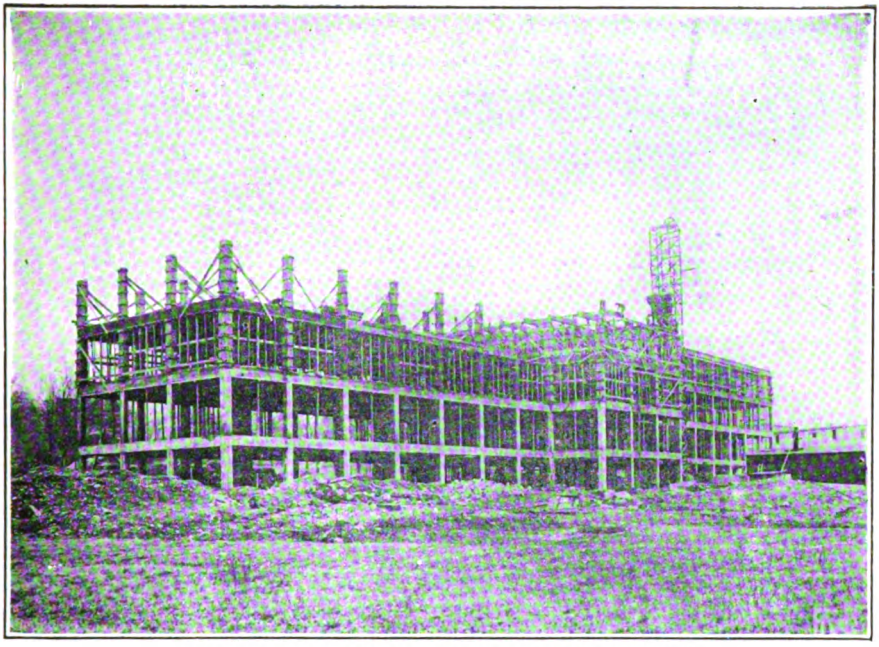
Facet, FACETTE (fas'et, fa-set'; literally a little face), one of a series of small circumscribed plane surfaces, as one of the small plane surfaces of a crystal or a cut gem.

Facetiæ (fa-sē'shi-ē), humorous sayings, witticisms, jests. There have been many collections of such. Amongst the most notable are the *Jests of Hierocles*, an old Greek collection, the *Liber Facetiarum* of Poggio Bracciolini, the *Apophthegms* of Bacon, *Joe Miller's Jest-Book*, etc.

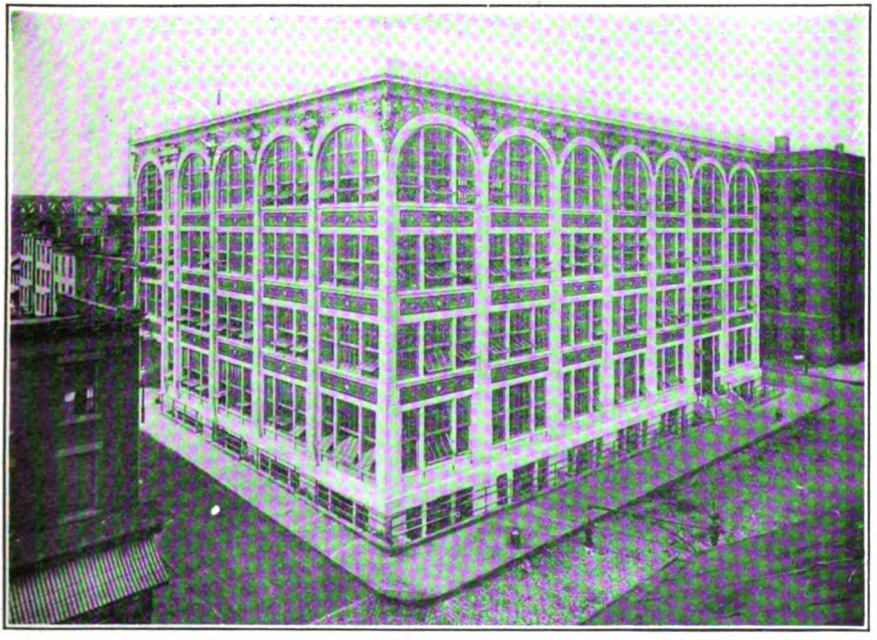
Facial Angle (fā'shal), an angle of importance in the method of skull measurement, introduced by Camper, the Dutch anatomist, who

FACIAL ANGLE.
1, European. 2, Negro.

sought to establish a connection between the magnitude of this angle and the intelligence of different animals and men, maintaining that it is always greater as the intellectual powers are greater. Suppose a straight line drawn at the base of the skull, from the great occipital cavity across the external orifice of the ear to the bottom of the nose, and another straight line from the bottom of the nose, or from the roots of the upper incisors, to the most prominent part of the forehead, then both lines will form an angle which will be more or less acute. In apes this angle is only from 45° to 60°; in the skull of a negro, about 70°; in a European, from 75° to 85°. In another mode of drawing the lines the angle included between them varies



CONCRETE FACTORY IN COURSE OF CONSTRUCTION



MODERN CONCRETE FACTORY BUILDING

The Thomson Meter Factory in Brooklyn. This method of construction makes it possible to secure the maximum of light and ventilation with strength and decorative effect. The upper view shows the method of constructing this type of building.

in man from 90° to 120°, and is more capable of comparison among the vertebrate animals than the angle of Camper. This angle though of some importance in the comparison of races, is fallacious as a test of individual capacity.

Facial Nerve, a nerve of the seventh pair of cranial nerves, a motor nerve which supplies the muscles of expression on either side of the face. Paralysis of this nerve produces *facial paralysis*, the result of which is that the affected side is smooth, unwrinkled, and motionless, the eyelids are wide open and cannot be closed, and the muscles of the sound side, having no collateral opposition, draw the mouth to that side.

Factor (fak'tur), in arithmetic, the multiplier and multiplicand, from the multiplication of which proceeds the product; thus 7 and 4 are the factors of 28. In algebra any expression which is considered as part of a product is considered a factor.

Factor, in commerce, an agent employed to do business for another in buying or selling, or in the charge of property. A factor seems to differ from a broker in holding a wider and more discretionary commission from his employer, in being able to buy and sell in his own name, and in having a lien on goods for his outlay; but the difference depends so much upon the usage of the particular trade, or upon the special instructions constituting the agency, that no exact line of demarkation can be drawn between them. The term factor has in common usage generally given place to the terms agent and broker, the former applied in the more general, the latter in the more restricted sense. It is still retained in some special cases, as in that of house factors and factors on landed property in Scotland, who have charge of the letting and general management of house property, farms, etc., called in England estate agents.

Factory (fak'tur-i; from *factor*), a name which appears originally to have been given to establishments of merchants and factors resident in foreign countries; it now more commonly signifies a place in which the various processes of a particular manufacture are carried on simultaneously. The rapid growth of factories in this sense is a comparatively recent development of industry, resulting from the free use of machinery and the consequent subdivision of labor. Amongst the advantages of the factory system are generally counted: 1st, increased productiveness arising from the minute division of labor; 2d, the mechanical accuracy and the cheapness of the product turned out by machinery; 3d, the facilities for union and co-operation for common improvement afforded by bringing large masses of workmen together. But this last consideration is probably more than counterbalanced by the smaller amount of independent intelligence called forth in the individual worker, through the monotony of the minutely subdivided operations. Decided disadvantages of the factory system are the unhealthiness of the crowded rooms, where the air is full of deleterious elements; and the increasing demand on the labor of women and children, interfering as it does with the economy of domestic life. See also next article.

Factory Acts, acts passed for the regulation of factories and similar establishments. Considering that women and children were not qualified fully to protect themselves against the strain of competition, the British legislature has passed a series of acts to regulate the conditions of their employment in factories. The immediate occasion of the first act passed to regulate factory employment in England was the outbreak of an epidemic disease which committed great havoc among the younger persons employed in factories in the district round Manchester at the beginning of the 19th century. An act was passed (1802) in which provision was made for the regular cleansing and ventilation of mills and factories, and also for limiting the hours of labor to twelve daily. Other acts were passed later further reducing the hours of labor and providing for proper sanitation, protection from danger, etc. In all the States of the American Union in which the factory is an industrial feature there has been legislation relative to the conditions of labor and the employment of women and children. Attention is given to the age of children employed, and attendance at public schools for a certain period each year is obligatory. The daily hours of labor are regulated. In some States the belting, shafting, etc., employed must be securely guarded. Penalties for violation of these provisions are designated.

Faculæ (fak'ū-lē), certain luminous spots sometimes visible on the sun's disc. These portions have a different spectrum from the other bright parts of the sun, as well as from the maculæ or dark sun-spots. See *Sun*.

Faculty (fak'ul-ti), the members taken collectively of the

medical or legal professions; thus we speak of the medical faculty, the faculty of advocates. The term is also used for the professors and teachers collectively of the several departments in a university; as, the faculty of arts, of theology, of medicine, or of law.

Faculty, in law, is a power to do something, the right to do which the law admits, or a special privilege granted by law to do something which would otherwise be forbidden.

Fæces (fē'sēz), the excrementitious part evacuated by animals. It varies, of course, with different species of animals, according to their diet. The main constituents are unassimilable parts of the food, on which the digestive process has no effect, and other portions, quite nutritious, but which have escaped digestion; also certain waste matters, etc. In disease the composition varies extremely.

Faed (fād), JOHN, a British artist, born in Kirkcudbrightshire in 1820. He showed artistic talent at an early age, in 1841 went to Edinburgh to study, and some years later acquired considerable reputation. Among his principal works are: *Shakespere and his Contemporaries; An Incident of Scottish Justice; The Morning after Flodden; A Wappenshaw;* two series of drawings illustrating *The Cotter's Saturday Night, The Soldier's Return, John Anderson My Jo,* and *Auld Mare Maggie.* In 1864 he went to London. He died in 1902.

Faed, THOMAS, younger brother of the preceding, born at the same place in 1826. He studied in Edinburgh, where at an early age he became known as a clever painter of rustic subjects. In 1852 he settled in London, where he won a high reputation. The subjects he painted were for the most part domestic or pathetic, and in these he contrived and told his own story, and that with a success that emulates Wilkie. Among his principal works are: *Sir Walter Scott and His Friends* (1849), *The Mitherless Bairn* (1855), *The First Break in the Family* (1857), *Sunday in the Backwoods* (1859), *His Only Pair* (1860), *From Dawn to Sunset* (1861), and *The Last o' the Clan* (1865). A number of Mr. Faed's works have been engraved in large size, and have been very popular. He died in 1900.

Faenza (fā-en'za), an episcopal city of N. Italy, in the province of and 19 miles southwest of Ravenna. It is supposed to have been the first Italian city in which earthenware was introduced; hence *Faience* (which see). The manufacture still flourishes here, and there is also a considerable trade in spinning and weaving silk. Pop. of commune 39,757.

Fagging (fag'ing), a custom which formerly prevailed generally at most of the English schools, and is still practised at Eton, Winchester, Harrow, Rugby, and one or two other places. It consists in making the junior boys act as servants or 'fags' in the performance of multifarious menial offices for the elder boys, such as carrying messages, preparing breakfast, etc., for their master in return for which the elder boy accepts a certain responsibility for keeping order, and becomes the recognized adviser and protector of his 'fags.'

Faggot-vote, a name in Britain for a vote procured by the purchase of property so as to constitute a nominal qualification without a substantial basis. Faggot-votes are chiefly used in county elections for members of parliament. The way in which they are usually manufactured is by the purchase of a property which is divided into as many lots as will constitute separate votes, and given to different persons, who may not be resident members of the constituency.

Fagotto (fa-got'tō), the Italian name of the bassoon (which see).

Fahlerz (fāl'erts), or gray copper ore, is of a steel-gray or iron-black color. It occurs crystallized in the form of the tetrahedron, also massive and disseminated. Its fracture is uneven or imperfectly conchoidal. Specific gravity, 4.5. It consists of from 30 to 40 per cent. of copper with admixture of iron and sulphur; but it also contains in very variable proportions zinc, lead, antimony, and silver.

Fahlunite. See *Falunite.*

Fahrenheit (fä'rē-nhīt), GABRIEL DANIEL, a German physicist, known for his arrangement of the thermometer, was born at Dantzig in 1686. Abandoning the commercial profession for which he had been designed, he settled in Holland to study natural philosophy. In 1720 he effected a great improvement by the use of quicksilver instead of spirits of wine in thermometers. He invented the Fahrenheit scale (see *Thermometer*), and made several valuable discoveries in physics. He died in 1736.

Faidherbe (fā-derb), LOUIS LÉON CÉSAR, a French general, born in 1818, entered the army in 1840, served in Africa and the West Indies, was appointed governor of Senegal in

1854, and afterwards of a district in Algiers from 1867 to 1870. After the fall of Napoleon III he was summoned by the government of the National Defense to France and appointed commander of the army of the north. He fought some bloody but indecisive battles with the Germans under Manteuffel and Goeben. After the war he was elected to the Assembly by Lille, his native place, but on the triumph of Thiers retired from politics to private life. He wrote some valuable monographs on Senegal, the Soudan, and other parts of Africa. He died in 1889.

Faience (fā-yāns'), imitation porcelain, a kind of fine pottery, superior to the common pottery in its glazing, beauty of form, and richness of painting, and of which several kinds are distinguished by critics. It derived its name from the town of Faenza, in Italy, where a fine sort of pottery called *majolica* was manufactured as early as the 14th century. The majolica reached its greatest perfection between 1530 and 1560. In the Louvre, at Berlin, and at Dresden are rich collections of it. The modern faience appears to have been invented about the middle of the 16th century, at Faenza, as an imitation of majolica, and obtained its name in France, where a man from Faenza, having discovered a similar kind of clay at Nevers, had introduced the manufacture of it. True faience is made of a yellowish or ruddy earth, covered with an enamel which is usually white, but may be colored. This enamel is a glass rendered opaque by oxide of tin or other suitable material, and is intended not only to glaze the body, but to conceal it entirely. See *Pottery*.

Failly (fā-yē), PIERRE LOUIS CHARLES ACHILLE DE, a French general, born in 1810. He distinguished himself in the Crimean war, and commanded a division against the Austrians in 1859. He was the means of introducing the Chassepot rifle into the French army, and commanded the troops which dispersed Garibaldi's irregulars at Mentana. At the outbreak of the Franco-German war Failly received the command of the Fifth Corps, but was severely criticised by his countrymen for the unskillfulness of his operations during the war. He died in 1892.

Fainéants (fā-nā-äṇ; Fr. 'do-nothings'), a sarcastic epithet applied to the later Merovingian kings of France, who were puppets in the hands of the mayors of the palace. Louis V, the last of the Carlovingian dynasty, received the same designation.

Fainting (fānt'ing), or syncope, a sudden suspension of the heart's action, of sensation, and the power of motion. It may be produced by loss of blood, pain, emotional disturbance, or organic or other diseases of the heart. It is to be treated by placing the patient on his back in a recumbent position or even with head slightly depressed, sprinkling cold water on his face, applying stimulant scents to the nostrils, or anything which tends to bring back the blood to the brain. The admission of fresh cool air and the loosening of any tight articles of dress are important.

Fairbairn (fār'bārn), PATRICK, a Scottish theologian and author, born 1805; died 1874. He became a minister of the Established Church, but joined the Free Church at the disruption in 1843. In 1853 he was appointed professor of divinity in the Free Church College, Aberdeen, and in 1856 principal of the Free Church College, Glasgow. Among his works are: *Typology of Scripture; Jonah, his Life, Character, and Mission; Ezekiel; Prophecy; Hermeneutical Manual; Pastoral Epistles of St. Paul.* He edited and wrote extensively for the *Imperial Bible Dictionary*.

Fairbairn, SIR WILLIAM, a British civil engineer, born at Kelso, Roxburghshire, in 1789; died 1874. He was apprenticed as an engine-wright at a colliery in North Shields, and commenced business on his own account in Manchester with a Mr. Lillie in 1817, where he made many improvements in machinery, such as the use of iron instead of wood in the shafting of cotton-mills. About 1831, his attention having been attracted to the use of iron as a material for shipbuilding, he built the first iron ship. His firm became extensively employed in iron shipbuilding at Manchester and at Millwall, London, and had a great share in the development of the trade. He shares with Mr. Stephenson the merit of constructing the great tubular bridge across the Menai Strait. Fairbairn was one of the earliest members of the British Association for the Advancement of Science, of which he was president in 1861-62. He was created a baronet in 1869. He wrote many valuable professional books and papers, amongst which we may mention: *On Canal Steam Navigation* (1831); *Iron—its History, Properties, and Manufacture* (1841); *Application of Iron to Building Purposes* (1854); *Iron Shipbuilding* (1865). His brother SIR PETER, born 1799, died 1861, was also a mechanical genius, and had large machine works at Leeds.

Fairbanks (fār'banks), CHARLES WARREN, vice-president, was born in Union Co., Ohio, in 1852. He engaged in legal practice in Indianapolis in 1874, took a prominent part in Republican politics, and was a candidate in 1893 for the United States Senate, but was defeated. He was elected to the Senate in 1897, and in 1898 was a member of the Joint High British-American Commission. He was vice-president of the United States, 1904-08, and was again nominated for that office in 1916, but was defeated. Died June 4, 1918.

Fairbanks, THADDEUS, American inventor and manufacturer, born at Brimfield, Mass., in 1796; died in 1866. At St. Johnsbury, Vt., he established a business for manufacturing cast-iron ploughs and stoves, and in 1831 received his first patent for an improved platform scale. Other varieties followed. His son, HENRY FAIRBANKS, born in 1830, was ordained to the Congregational ministry in 1857. Later he became vice-president of E. and T. Fairbanks & Co.

Fairbury (fār'ber-i), a city, capital of Jefferson Co., Nebraska, 60 miles S. S. W. of Lincoln. It has flour and planing mills, iron-works, creamery, and nurseries. Pop. 5294.

Fairfax, THOMAS, LORD, a distinguished commander and leading character in English civil wars. He was born in 1611, at Denton, in Yorkshire, being son and heir of Ferdinando, Lord Fairfax, to whose title and estates he succeeded in 1648. After serving in the Netherlands with some reputation he returned to England, and on the rupture between Charles I and the Parliament joined the forces of the latter. In 1642 he was appointed general of the horse, and two years later held a chief command in the army sent to co-operate with the Scots. In 1645, on the resignation of the Earl of Essex, Fairfax became general-in-chief of the parliamentary army. After the victory at Naseby he marched into the western counties, quelling all opposition, put down the insurgents in Kent and Essex in 1647, and captured Colchester. In April, 1649, he was occupied along with Cromwell in suppressing revolt in the army; but positively declined to march against the Scottish Presbyterians. He was a member of Cromwell's first parliament. He co-operated in the restoration of Charles II, being one of the committee charged to secure his return. He died at Nun Appleton, Yorkshire, in 1671.

Fairhaven, a town in Bristol County, Massachusetts, 1 mile E. of New Bedford, on the New York, New Haven and Hartford Railroad. It has ironworks, tack factory, etc. Pop. 5122.

Fair Head, a basaltic promontory on the north coast of Ireland, County Antrim, rising to the height of 636 ft.

Fairies (fār'ēz), ELVES, etc., imaginary supernatural beings or spirits supposed to have considerable influence for good or evil in the affairs of men. The name *fairy* comes ultimately from the Latin *fatum*, fate. In the 12th century the poem of *Lancelot of the Lake* introduced the poetical treatment of the fairy world into France; and the fairies played an important part in the romantic works of the time. In the last part of the 17th century the true fairy tales first became popular, the Italians taking the lead in the *Pentameron* of Basilio. The fashion passed to France, where Perrault in 1697 published *Contes de ma Mère l'Oye.* Numerous imitations soon appeared. The best collections of later times have been the *Cabinet des Fées* (Paris and Geneva, 1786, thirty-seven vols.); those of the Brothers Grimm in German, and in English those of Keightley and Croker. As an original writer of fairy tales, Hans Christian Andersen, the celebrated Dane, deserves particular mention.

Fair Isle, an island lying nearly midway between the Orkney and Shetland islands, 3 miles long by 2 broad. It is inaccessible except at one point, and rises to the height of 480 ft. Some grain is grown, but the surface is better suited for sheep pasture. The men employ themselves in fishing, and the women knit a well-known variety of hosiery, an art which, it is said, the Spaniards introduced who escaped from a vessel of the Armada. Pop. 214.

Fairmont (fār'mont), a city, capital of Marion Co., West Virginia, on the Monongahela river, 77 miles S. E. of Wheeling. Its buildings include a State normal school. It is an important mining city and has ironworks, glass factories, mining machinery plants, etc. Pop. 16,000.

Fair Oaks, BATTLE OF, fought at Fair Oaks in Virginia, 7 miles E. of Richmond, between the Confederates under Gen. Johnston and the Union troops under Gen. McClellan, 31st May, 1862. The loss on each side was nearly 6000 men; the result was indecisive.

Fairs (fārs), periodical meetings of persons having goods or wares for sale in an open market held at a particular place, and generally for the

transaction of a particular class of business. The origin of fairs is obviously to be traced to the convenience of bringing together at stated times the buyers and sellers of the stock-produce of a district. In Europe the numerous festivals of the church afforded the most favorable opportunity for the establishment of these markets. This association is indicated in the German name of a fair, which is identical with that used for the ceremony of the mass. In the middle ages fairs were of great importance, and were specially privileged and chartered by princes and magistrates, public proclamation being made of their commencement and duration. But modern facilities of communication have much diminished the necessity for periodical markets, and it is now chiefly amongst agriculturists that they are of much importance, large agricultural meetings being held in various districts for the sale of cattle and horses, and for the exhibition of agricultural implements. There are also, especially in Scotland, a considerable number of hiring fairs for farm-servants. In the less developed commerce of the East, however, they still retain much of their ancient importance and magnitude. In Europe the most important fairs of the present day are those at Leipzig and Frankfort-on-the-Main in Germany, at Lyons in France, and at Nijni-Novgorod in Russia. The latter is, indeed, the largest fair in the world. The fairs of Great Britain now mostly consist of the weekly market-days of country towns and the agricultural meetings already mentioned. In many places the old fair days are still kept, but are now merely an assemblage of penny theaters, peep-shows, and such amusements. In the United States there are no fairs of the kind so common in the old world; the term is applied to a variety of local exhibitions, especially of cattle and agricultural products; it also includes exhibitions and sales for religious and charitable purposes; likewise the fairs of the American Institute of New York, the Franklin Institute of Philadelphia, the Maryland Institute, and of many other organizations. For World's Fairs, see *Exhibition, Industrial.*

Fair Trade, an economical policy advocated by many in Britain, which, while not opposed to free trade in principle, would meet the prohibitory tariffs that foreign countries may put on British goods by placing equally heavy duties on goods sent from these countries to Britain. See *Free Trade.*

Fairweather, MOUNT, on the west coast of North America, in Alaska territory. It rises to the height of 14,900 feet, and is covered with perpetual snow.

Fairy Rings, a name given in Britain to rings often seen in fields, etc., formerly supposed to be traced by the fairies in their dances. There are two kinds—one of 6 or 7 yards in diameter, consisting of a bare ring or path, about a foot broad, with green grass in the middle of it; another of smaller dimensions, formed by a circle of grass, greener and fresher than that in the middle. They are ascribed to a kind of fungus.—FAIRY-RING MUSHROOM (*Marasmius oreades*) is a variety of edible mushroom that grows in an ever-widening circle, constantly spreading outward a few inches each year, the innermost sections dying. The stem has no ring, the gills are few and far apart, and the cap, as it becomes widely expanded, has a peculiar knob-like projection in the center. The cap and stem have a pinkish-buff color, and the gills a lighter shade of the same, varying in its younger stages toward a cream color. The spores are white. They can be found in many old, well-kept lawns. They seldom form complete circles. Several crops grow during each season.

Faith (fāth), the assent of the mind to the truth of what is declared by another, resting on his authority and veracity, either without other evidence or on probable evidence of any kind. In a special sense the term faith is used for the assent of the mind to what is given forth as a revelation of man's relation to God and the infinite, *i.e.*, a religious faith; and in Christian theology we have (1st) *historical or speculative faith*, or belief in the historic truthfulness of the Scripture narrative and the claims of Scripture to an inspired and supernatural origin: (2d) *Evangelical or saving faith*, that emotion of the mind (as Dwight defines it) which is called trust, or confidence exercised towards the moral character of God, and particularly of the Saviour.

Faith, CONFESSION OF. See *Confession of Faith.*

Faith Cure, a system in which it is claimed that ailments can be cured without remedies and through the exercise of faith alone. The faith appears to be in the ability of certain individuals to produce this result, or in certain objects, as an image of the Virgin or other religious emblem. That the mind has an influence over the condition of the body is undoubted, but that

the mind of another person can influence the physical conditions of a person is problematical. There are certain evidences in its favor, but far too much seems to be claimed for it.

Faizabad (fī-zä-bäd'). See *Fyzabad.*

Fakirs (fa-kērz'; lit. 'poor men'), a kind of fanatics met with chiefly in India and the neighboring countries, who retire from the world and give themselves up to contemplation. They are properly of the Mohammedan religion, but the term is often used for a mendicant of any faith. They are found both living in communities and solitary. The wandering fakirs gain the veneration of the lower classes by absurd penances and self-mutilations.—A name (pron. fā'kerz) also applied to peddlers in America.

Falaise (fȧ-lāz), a town of France, dep. Calvados, picturesquely situated on a rocky precipice (Fr. *falaise*) 23 miles S. S. E. of Caen. It contains several objects of interest, among others the ruined castle of the dukes of Normandy, where William the Conqueror was born. Pop. (1906) 6215.

Falashas. See *Abyssinia.*

Falckenstein (fal-kin'stīn), EDWARD VOGEL VON, a Prussian general, born in 1797; died in 1885. In 1813 he entered the Prussian army, distinguished himself at the battles of Katzbach and Montmirail. In 1848 he served in the Holstein campaign, and he acted as colonel and chief of staff in the war with Denmark in 1864. In the war of 1866 he commanded the Seventh Army Corps. On the outbreak of the Franco-German war in 1870 he was appointed military governor of the maritime provinces.

Falcon (fal'kn, fą'kn), a name of various birds of prey, members of the family Falconidæ (which see). The falcons proper (genus *Falco*), for strength, symmetry, and powers of flight are the most perfectly developed of the feathered race. They are distinguished by having the beak curved from the base, hooked at the point, the upper mandible with a notch or tooth on its cutting edge on either side, wings long and powerful, the second feather rather the longest, legs short and strong. The largest European falcons are the jerfalcon or gyrfalcon proper (*Falco gyrfalco*), a native of the Scandinavian Peninsula, and the Iceland falcon (*F. Islandicus*); to which may be also added the Greenland falcon (*F. Groenlandicus* or *candicans*). Between these three species much confusion at one time prevailed, but they are now distinctly defined and described. In the Greenland falcon the prevailing color at all ages is white, in the Iceland falcon dark. The latter more nearly resembles the true gyrfalcon of Norway, which, however, is

Peregrine Falcon (*Falco peregrinus*).

generally darker, rather smaller but with a longer tail. The average length of any of these falcons is about 2 feet. The Greenland species used to be the most highly prized by falconers. Its food consists chiefly of ptarmigans, hares and water-fowl. It is found over a wide range of northern territory. The peregrine falcon (*F. peregrinus*) is not so large as the jerfalcon, but more elegant in shape. It chiefly inhabits wild districts, and nestles among rocks. It preys on grouse, partridges, ptarmigans, pigeons, rabbits, etc. Its flight is exceedingly swift, said to be as much as 150 miles an hour. The peregrine falcon was one of those most frequently used in falconry. Other European falcons are the hobby (*F. subbuteo*), formerly a great favorite for the chase of small game when falconry was in fashion; the merlin (*F. æsălon*), small but swift and spirited; the kestrel (*F. tinnuncŭlus*), one of the most common. The term falcon is by sportsmen restricted to the female, the male, which is smaller and less courageous, being called *tiercel, tersel, tercelet,* or *falconet.* See *Falconry.*

Falcone (fȧl-ko'nā), ANCELLO, an Italian painter, born in 1600, studied along with Salvator Rosa under Spagnoletto. His paintings, consisting chiefly of battlepieces, are highly esteemed, but very rare. He died in 1665.

Falconer (fąk'nėr), HUGH, a Scottish naturalist, born in 1808. After studying arts at Aberdeen and medicine at Edinburgh he went to

India as a surgeon in 1830. Here he made valuable geological researches, and turned his attention to the introduction of tea cultivation. He was appointed superintendent of the Saharanpur botanic garden in 1832 and of the Calcutta botanic garden in 1847. A collection of his papers, entitled *Palæontological Memoirs and Notes*, was published in 1868. In 1855 he returned to England, where he died in 1865.

Falconer, WILLIAM, poet and writer on naval affairs, born at Edinburgh in 1732; was drowned in 1769. He published a poem *(The Shipwreck)* and a *Universal Marine Dictionary.*

Falconidæ (fal-kon'i-dē), a family of birds of prey, in which the destructive powers are most perfectly developed. The family includes the different species of eagles as well as the hawks and falcons properly so-called, comprising the sub-families Buteonīnæ (buzzards), Polyborīnæ (caracaras), Aquilīnæ (eagles), Falconīnæ (falcons), Milvīnæ (kites), Accipitrīnæ (hawks), and Circīnæ (harriers).

Falconio (fäl-kō'ni-ō) DIOMEDE, an Italian prelate born in Pescocostanzo, Italy, in 1842. He came to the U. S. as a missionary in 1865; was ordained a priest in the following year, holding educational and administrative positions in the U. S. and Newfoundland until 1883, when he returned to Italy; was consecrated bishop, 1892, and archbishop, 1895. He was Apostolic Delegate to Canada, 1899–1902; to the United States, 1902–1911; became cardinal, 1911.

Falconry (fal'kn-ri, fą'kn-ri), the pursuit of game by means of trained falcons or hawks; also called *Hawking.* Falconry is a very old amusement in Europe and Asia. In the middle ages it was the favorite sport of princes and nobles; and, as ladies could engage in it, it became very prevalent. Charlemagne passed laws in regard to falconry. In Germany Henry the Fowler and the Emperor Frederick the Second were much addicted to this sport, the latter having written a work on falconry. In France it reached its height under Francis I, whose grand falconer had under him an establishment of 15 nobles and 50 falconers, costing annually about 40,000 livres. In Britain it was practised among the Anglo-Saxons, but grew still more in favor after the Norman Conquest. One of the most interesting English works on the subject is that which forms the first part of the *Boke of St. Albans*, first printed in 1481. In England the Duke of St. Albans is still hereditary grand falconer, and presents the king with a cast (or pair) of falcons on the day of his coronation. Falconry continued in favor till the 17th century; but the invention of firearms gradually superseded it, though in isolated instances gentlemen may still be found who pursue the sport to some little extent. In Persia and other eastern

Goshawk hooded for Falconry.

countries hawking is still in great favor. The training of a hawk is a matter requiring great pains and protracted attention, the natural wildness and intractableness of the birds being difficult to overcome. When a hawk suffers itself to be hooded and unhooded quietly and will leap on the hand of the trainer to receive food, its education is considered far advanced, and the trainer now endeavors to accustom it to the *lure.* This may be a piece of leather or wood covered with the wings and feathers of a bird and attached to a cord. The falcon is fed from it, and is recalled by the falconer swinging the lure round his head with an accompanying cry. When it has been taught to obey the lure it is then practised in the mode of seizing its game, which is first done with tame game attached to a peg. It is then made to fly at free game, and when it is fully trained it is used for sport. It is always kept hooded during excursions, until it is wanted to fly.

Faldstool (fąld'stōl), a folding stool provided with a cushion for a person to kneel on during the performance of certain acts of devotion, especially a kind of stool placed at the south side of the altar, on which the kings of England kneel at their coronation. The term is also given to a small desk at which the litany is enjoined to be sung or said.

Falernian Wine (fą-lĕr'ni-an), an ancient wine of

great repute amongst the Romans. It was made from the grapes grown on Mount Falernus in Campania. It was strong and generous, probably much resembling modern sherry.

Falieri (fa-li-ā'rē), MARINO, Doge of Venice, born in 1274, commanded the troops of the republic at the siege of Zara in Dalmatia, where he gained a brilliant victory over the King of Hungary. He succeeded Andrea Dandolo, 11th October, 1354, was accused of a design to overthrow the republic and make himself sovereign of the state, and beheaded 17th April, 1355. The last scenes of his life are depicted in Byron's tragedy of *Marino Falieri*.

Falkirk (fal'kĕrk; Scot. pron. fą'kirk), a burgh of Scotland, in Stirlingshire, 21½ miles west by north of Edinburgh. The older portion of it is old-fashioned and irregularly built. There are several modern suburbs. In the town or its vicinity are the Carron Ironworks, the Falkirk Foundry, and other works, collieries, chemical works, distilleries, etc. Falkirk is connected with the port of Grangemouth by a railway 3 miles long. The Trysts of Falkirk, held on Stenhousemuir, 3 miles to the N. N. W., are the largest cattle-fairs in Scotland. Falkirk is of great antiquity, and is associated with many remarkable historical events. In the neighborhood was fought the Battle of Falkirk in 1297 between Sir William Wallace and Edward I, the Scots, who were much inferior in numbers, being defeated. About 1 mile southwest from the town the Highlanders under Prince Charles defeated the royal forces under General Hawley, Jan. 17, 1746. Pop. (1911) 33,574.

Falkland (fąk'land), an ancient royal burgh of Scotland, county of Fife, 21 miles north of Edinburgh. It was once the residence of the Scottish kings, and possesses remains of an ancient palace and some curious old houses. There was formerly a castle here, in which David, the eldest son of Robert III, was starved to death by order of his uncle, the Duke of Albany, but no trace of it now remains. Pop. 809.

Falkland (fąk'land), LUCIUS CARY, VISCOUNT, an English worthy, born about 1610. His father being then Lord-deputy of Ireland, he was educated at Trinity College, Dublin. After passing a short time abroad he devoted himself to a life of retirement and the cultivation of polite literature, chiefly residing at his seat at Burford, near Oxford, which he made a kind of academy for the learned men of the neighboring universities. In 1639 he joined the expedition against Scotland; and in 1640, his peerage being Scottish, he was chosen member of the House of Commons for Newport, in the Isle of Wight. In the first instance he warmly supported the parliament, but doubts of the ultimate objects of the parliamentary leaders caused him to modify his attitude; and in 1642 he accepted from Charles I the office of secretary of state. When hostilities began he embraced decidedly the cause of the king, though he wished rather peace than victory. He was slain at the battle of Newbury, 20th Sept., 1643. He left behind him several pamphlets and published speeches, also a few poems, but nothing that explains the universal praises bestowed on him by contemporaries.

Falkland Islands, an island group belonging to Great Britain, in the South Atlantic Ocean, about 300 miles east of the Straits of Magellan. They consist of two larger islands, East Falkland and West Falkland, containing respectively about 3000 and 2300 square miles, with a great number of smaller ones surrounding them; total area, 6500 sq. miles. They are hilly and boggy, entirely destitute of trees, but covered with a variety of grasses very nutritive for the sheep and cattle the rearing of which is the principal industry. Fish and sea-fowl abound. Wool, frozen meat, hides, and tallow are the chief exports. The climate is equable and very healthy. The Falkland Islands were discovered by Davis on the 14th August, 1592. In 1710 a French vessel from St. Malo touched at them, and named them Isles Malouines. Settlements were afterwards formed on them by the French, Spaniards, and English alternately, but the latter have ultimately retained possession of them.

Fallacy (fal'a-si), in logic, is when an argument is used as decisive of a particular issue which in reality it does not decide. Properly a fallacy is a fault of reasoning (see *Logic*).

Fallières (fál'-yār'), ARMAND, president of the French Republic, 1906-13, was born at Mezin, Lot-et-Garonne, in the south of France, in 1841. He studied law and became mayor of Nerac in 1870. Elected to the Chamber of Deputies he soon became conspicuous as a debater. He served in various ministries from 1880, and in 1890 was elected senator. He was president of the senate from 1899 until he was elected eighth president of France, Jan. 17, 1906. He was succeeded in 1913 by Raymond Poincaré.

Fall of Bodies. All bodies on the earth, by virtue of the attraction of gravitation, tend to the center of the earth. A ball held in the hand presses downward; if dropped, it descends perpendicularly; if placed on an inclined plane, it rolls down, in doing which it presses the plane with a part of its weight. In the air bodies fall with unequal velocities, a piece of paper, for instance, more slowly than a ball of lead; and it was formerly thought that the velocity of the fall of bodies was in proportion to their weight. This error was attacked by Galileo, who, experimenting with balls of different substances which he dropped from the tower of Pisa, was led to the conclusion that the resistance of the air acting on different extents of surface was the cause of the unequal velocities, and that in a vacuum all bodies would fall with the same velocity. The truth of this last proposition was first demonstrated by Newton in his celebrated 'guinea-and-feather' experiment, where a guinea and feather are shown to fall side by side in the vacuum of the air-pump. This experiment proves that the force of gravitation in bodies is proportional to their inertia—that is, to their mass. The laws of falling bodies—that is, of bodies falling freely in a straight line and through a distance short in comparison with the earth's center are the following:—

1. When a body falls from rest it acquires velocity at the rate of about 32.2 feet per second. This number, which represents the acceleration due to the force of gravity, varies slightly with the locality, increasing from the equator to the poles, and diminishing as we recede from the center of the earth. (See *Gravity, Force of.*) At the end of five seconds, therefore, the body would be found to be moving at the rate of 5×32.2, that is, 161 feet per second.

2. The space fallen through in the first second is half of 32.2, that is 16.1 feet; and the space fallen through in any given time is found by multiplying the square of the number of seconds by 16.1. Thus, in three seconds a body falls 9×16.1 feet, or 144.9 feet.

3. The square of the velocity acquired by falling through any number of feet is found by multiplying twice that number by 32.2. Thus, if a body falls 9 feet, the square of the velocity acquired is $2 \times 32 \times 9$, or 576 feet per second, 32 being used instead of 32.2; and taking the square root of 576, we find that a velocity of 24 feet is acquired in a fall of 9 feet.

4. When a body is projected vertically upward with a given velocity, it continues to rise during a number of seconds found by dividing the number that expresses the velocity of projection by 32.2; and it rises to a height found by dividing the square of that number by 2×32.2, or 64.4. For a machine used in verifying the laws of falling bodies see *Attwood.*

Fall of Man, a commonly received doctrine of Christianity, founded upon the historical narrative contained in the third chapter of the book of Genesis, together with the allusions to the same matter in other parts of Scripture. Adam, having eaten of the forbidden fruit, is said to have fallen; and the relation of mankind in general to this fall is stated by St. Paul in the words: 'By one man's disobedience many were made sinners' (Rom., v, 19). Thus, in the fall of Adam all men are held to have fallen and to have contracted 'original sin,' alienating them from God and rendering them morally inadequate. The doctrine of the fall does not stand alone in Scripture. It is universally agreed by interpreters that in the original sentence pronounced on the transgressors there is contained the promise of a redemption, and that the whole scope of Scripture is directed to the development of this promise, and of the divine scheme of providence associated with it.

Fallopian Tubes (fa-lō'pi-an tūbs), in anatomy, are two ducts which open by one extremity into the womb, one at either angle of the fundus, and terminate at the other end in an open, trumpet-shaped mouth, which at certain times grasps the ovary and receives the ovum. They are named after Gabriel Fallopius or Falloppio, an Italian anatomist of the sixteenth century, who first recognized their functions.

Fallow Deer (fal'ō), an European and Western Asiatic deer, the *Cervus dama.* It is smaller than the stag, of a brownish-bay color, whitish beneath, on the insides of the limbs, and beneath the tail. The horns, which are peculiar to the male, are very different from those of the stag; they are not properly branched, but are broader towards the upper part, and divided into processes down the outside. A simple snag rises from the base of each, and a similar one at some distance from the first. It is often kept in parks.

Fallow Land is ground that has been left uncultivated for a time, in order that it may recover itself from an exhausted state. Strictly speaking, fallow ground is left alto-

gether without crops; but in agricultural usage strict fallow is not always adopted, and the term fallow is applied to various modes of treatment, of which at least three distinct varieties are recognized: *bare fallow*, *bastard fallow*, and *green-crop fallow*. Bare fallow is that in which the land remains completely bare for a whole year; in bastard fallow it is plowed up and worked after the removal of a spring or summer crop, preparatory to the sowing of a root or forage crop, to occupy the ground during autumn or winter; in green-crop fallow the land is sown with a root-crop, such as turnips or potatoes, placed in rows far enough apart to admit of the intermediate spaces being stirred, pulverized, and cleaned, during its growth, by horse or hand implements.

Fall River, county seat and port of Bristol County, Massachusetts, on an arm of Narragansett Bay and Taunton River, 53 miles s. s. w. of Boston. It is at the head of deep-water navigation, and the terminus of a line of steamers from New York. It has abundant water-power and very large and numerous cotton factories, an extensive hat factory, a piano factory, and calico-printing factories, foundries, etc. The city has two high schools and a free textile school, besides many public buildings. Its commerce is important. Pop. 119,295.

Falmouth (fal'muth), a seaport of Cornwall, England, 250 miles w. s. w. of London. There is a good harbor here, with a fine roadstead affording excellent refuge for shipping. Falmouth was at one time an important packet station, but is now chiefly a port of call, its principal trade being in supplies and stores for shipping. Pop. (1911) 13,136.

False Bay, a bay of the Cape Colony, having the Cape of Good Hope at its entrance. See *Cape of Good Hope.*

False Imprisonment, the unlawful imprisonment or detention of any person. Every confinement of the person is imprisonment, whether in a common prison or a private house, or even by forcibly detaining one in the streets or highways. The law punishes false imprisonment as a crime, besides giving reparation to the party injured, through an action of trespass.

False Personation. All forms of false personation, for the purpose of obtaining the property of others, are punishable by the criminal law; as instances, the personation of the owner of any share, stock, or annuity, etc.; the false personation of voters at an election is a misdemeanor, the punishment of which is determined by State statute, involving fine, imprisonment, and deprivation of the rights of citizenship of the convicted person for a certain period.

False Pretenses. False representations and statements, made with a fraudulent design to obtain 'money, goods, wares, and merchandise,' or trust, with intent to cheat. At common law a misdemeanor, punishable by statute.

False Prophecies, with intent to disturb the peace, are misdemeanors at common law.

False Signals. To exhibit a false signal, with a view to bring a ship into danger, is a felony, punishable by statute.

Falsetto (fäl-set'ō) applies, in singing, to the notes above the natural compass of the voice. It is also called the *head* or *throat* voice, in contradistinction to the *chest* voice, which is the natural one. The falsetto voice is produced by tightening the ligaments of the glottis.

False Weights and Measures. The using of false weights and measures is an offense at law punishable by fine. By various statutes standards are provided for weights and for measures of capacity or dimension, and all contracts of sale, etc., are referred to such standards unless there is a special agreement to the contrary. See *Weights and Measures.*

Falster (fäl'ster), an island belonging to Denmark, situated at the entrance of the Baltic, east of Laaland, from which it is separated only by a narrow strait; flat, well watered and wooded; productive in grain, pulse, potatoes, and, above all, fruit; area, 183 square miles. The principal town is Nykjöbing, Pop. 34,436.

Falun, or FAHLUN (fä'lųn), a town of Sweden, on Lake Runn, 130 miles northwest of Stockholm. It has an excellent mining-school, museums, mineralogical collections, etc., Within the town boundary is the famous Falun copper-mine, formerly the richest in Sweden, and worked for 500 years. Silver and gold are also found here. Pop. 9606.

Falunite (fäl'un-īt), a mineral of a greenish color, occurring in six-sided prisms. Its chief constituent is hydrated silicate of alumina. It takes its name from Fahlun or Falun in Sweden.

Famagosta, or FAMAGUSTA (fä-mà-gös'ta), a seaport on the east coast of Cyprus. It is of remote antiquity, was an important place during the middle ages under the Lusignan kings of Cyprus and the Venetians, but, after being captured by the Turks in 1571, it declined. It has improved, however, in late years, since it came into the hands of the British.

Famatina (fa-ma-tē'na), a district and mountain range in the Argentine Republic, province of La Rioja, rich in copper; highest summit, the Nevada de Famatina, 19,758 feet high.

Familiar Spirits (fa-mil'yar), demons or evil spirits supposed to be continually within call and at the service of their masters, sometimes under an assumed shape, sometimes attached to a magical ring or the like, sometimes compelled by magic skill, and sometimes doing voluntary service. We find traces of this belief in all ages and countries, under various forms.

Family (fam'i-li), in zoological classifications, a group of individuals more comprehensive than a genus and less so than an order, a family usually containing a number of genera, while an order contains so many families. Family names usually terminate in -idæ (after Latin patronymics, such as Æacidæ, sons or descendants of Æacus). In botany it is sometimes used as a synonym of order.

Family Compact, the name given to a compact organized by the Duke de Choiseul, first minister of Louis XV, between the various members of the Bourbon family, then sovereigns of France, Spain, the Two Sicilies, Parma, and Piacenza, mutually to guarantee each other's possessions. It was signed 15th August, 1761, and entailed on Spain a war with England.

Famine (fam'in), a dire want of food affecting considerable numbers of people at the same time. Irregular rainfalls in tropical climates, imperfect methods of irrigation, or, as in Ireland, the too exclusive dependence of the mass of the people on a single article of food which happens to fail, are amongst the commonest causes of famines. In the early and mediæval ages they were frequent; but the rapidity of modern communication and transport has made the rigor of famine almost impossible in Europe. In Ireland the years 1814, 1816, 1822, 1831, and 1846, were marked by failure of the potato crop, and in the last-mentioned year the dearth was so great that £10,000,000 were voted by parliament for relief of the sufferers. India has long been the seat of terrific famines; but of late the British officials have been very successful in organizing relief measures. Amongst the more recent are that in Northwest India (1899-1900), in which above 800,000 perished; that in Bengal and Orissa (1865-66), when about a million perished; that in Bengal (1874), which was very successfully treated; that in Bombay, Madras, Mysore (1877), in which about half a million died. In China a great famine took place in 1877-78, in which over nine millions are said to have perished; another took place in 1888-89 owing to the overflow of the Yellow River; in 1897 a frightful one occurred in India.

Fan, the name of various instruments for exciting a current of air by the propulsion of a broad surface or the rapid motion of a small surface. (1) An instrument made of wood or ivory, feathers, thin skin, paper, variously constructed and mounted, and used by ladies to set the air in motion towards and thus cool the face. As an article of luxury the fan was well known to the Greeks and Romans. They are said to have been introduced into England from Italy in the reign of Henry VIII. (2) Any contrivance of vanes or flat discs revolving by the aid of machinery, as for winnowing grain, for cooling fluids, urging combustion, assisting ventilation, etc., is also so called.

Fan, an abbreviation of *Fanatic*, applied to baseball enthusiasts, particularly those who attend professional games.

Fanariots, or PHANARIOTS (fan-ar'i-ots), the inhabitants of the Greek quarter, or Phanar, in Constantinople, particularly the noble Greek families resident there since the times of the Byzantine emperors. The dragoman or interpreter of the Porte and other high officials used to be taken from their number. They have now mostly lost their influence at Constantinople, and have in many cases transferred themselves to Athens.

Fanaticism (fan-at'i-cizm), the term applied more particularly to the extravagance manifested in religious matters by those who allow themselves to be hurried away by their fancy and feelings, to the adoption not only of wild enthusiastic views, but also of inordinate and not infrequently persecuting measures. By an extension of the term it is also sometimes applied to other forms of extravagance. See *Fan*, second.

Fancy (fan'si) a term approaching imagination in meaning. In its general acceptation it refers both to the forms of the imagination and to the mental faculty which produces them; but it is used frequently for the lighter or more fantastic forms of the imagination, and for the active play of that faculty which produces them. See *Imagination.*

Fancy Goods, fabrics of various patterns; as ribbons, silks, satins, etc., differing from those which are of a plain or simple color, rather ornamental than solid or useful.

Fandango (fan-dang'go), an old Spanish dance, which originated most probably with the Moors in Andalusia. It is seldom danced but at the theater, and in the parties of the lower classes. It is danced by two persons only, who never touch so much as each other's hands; their reciprocal allurements, retreats, approaches, and varied movements, by turns pursuing and pursued, their looks, attitudes, and whole expression, are grossly indicative of voluptuousness.

Faneuil Hall (fan'ū-il), a public building in Boston, famous as the place where stirring speeches were made at the outbreak of the war for American independence. It obtained the name 'The cradle of American liberty.' It was enlarged in 1805.

Fanfare (fan'fār), a short, lively, loud, and warlike piece of music, composed for trumpets and kettle-drums. Also small, lively pieces performed on hunting-horns, in the chase.

Fan-foot, a name given to a North African lizard of the genus *Ptyodactylus* (P. Gecko), one of the geckoes, much dreaded in Egypt for its supposed venomous properties.

Fanning Islands (fan'ing), a group of coral islands in Central Polynesia between 1° 57′ and 5° 49′ N. lat., and between 157° and 162° W. lon. They include Jarvis, Christmas, Washington, Palmyra, and Fanning, and have been occupied by the British. The population is very small.

Fano (fä'nō), a seaport of Italy, on the Adriatic, province of Pesaro e Urbino, 29 miles northwest of Ancona. It is a handsome, well-built town, and has a triumphal arch, erected to Augustus, and other antiquities. Pop. 10,535.

Fan-palm, a name sometimes given to the taliput palm or *Corỳpha umbraculifĕra*, a native of Ceylon and Malabar. (See *Taliput Palm.*) It is also applied to the Mauritia palm (*Mauritia flexuōsa*), a tree which grows in great abundance on the banks of the Orinoco River in South America, and which yields the natives of these regions food, wine (made from its sap), and cordage, besides serving them for housing during the inundations to which the country is subject.

Fans, an African race of people inhabiting the region of the west coast about the Gaboon River and the Ogoway. They are an energetic race, skilled in various arts, and are rapidly increasing in numbers. They are cannibals, but contact with Europeans is leading them to give up the practice.

Fanshaw (fan'shaw), Sir Richard, an English diplomatist, poet, and translator, born in 1608. He studied at Cambridge; was secretary of the English embassy at Madrid; and took the royal side on the outbreak of the civil war in 1641. He was made a baronet in 1650, was taken prisoner at Worcester, but permitted to go at large on bail. After the restoration he was employed on several diplomatic missions, and in 1664, as ambassador at Madrid, negotiated a peace between England, Spain, and Portugal. He died at Madrid in 1666. His poetical abilities were above mediocrity, as is evinced by his translations of the *Lusiad* of Camoens, the *Pastor Fido* of Guarini, the *Odes* of Horace, and the fourth book of the *Æneid.*

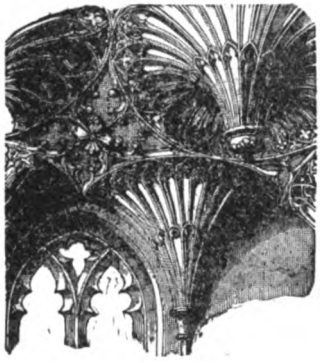
Fantail, a variety of the domestic pigeon, so called from the fan-like shape of their tails. Also a name applied to certain Australian birds of the fly-catcher family.

Fantasia (fan-tā'zi-a), in music, a species of composition in which the author ties himself to no particular theme, ranging as his fancy leads him amidst various airs and movements.

Fantee (fan-tē'), a country of Africa, on the Gold Coast, which extends about 90 miles along the shore of the Atlantic and 70 inland. The inhabitants, called *Fantees*, were the most numerous and powerful people situated immediately on the Gold Coast; but their power has been almost entirely broken since 1811 by repeated invasions of the Ashantees and they have since lived under British protection. The soil is fertile, producing, among other things, fruits, maize, and palm-wine.

Fan-tracery, in architecture, elaborate geometrical carved work, which spreads over the surface of a vaulting, rising from a corbel and diverging like the folds of a fan. Fan-tracery vaulting is much used in the Perpendicular style, in which the vault is covered by ribs and veins of tracery, of which all the principal lines diverge from

a point, as in Henry VII's chapel, Westminster.



Fan-tracery Vaulting, Beauchamp Chapel, Warwick.

Farad (far'ad), the unit of electrical capacity. Its name is derived from that of Michael Faraday, the famous electrician.

Faraday (far'a-dā), MICHAEL, one of the greatest of English chemists and physicists, was born in humble circumstances at Newington Butts, near London, on September 22, 1791. Early in life he was apprenticed to a bookbinder in London, but occupied himself in his leisure hours with electrical and other scientific experiments. Having been taken by a friend to Sir Humphry Davy's lectures, he attended the course, and conceived such an ardent desire for study that he resolved to quit trade. With this end he sent his notes of the lectures to Sir Humphry Davy, who was so struck with the great ability they showed that he appointed him his assistant at the Royal Institution. In 1829 he became lecturer at the Royal Military Academy at Woolwich, and in 1833 he was appointed to the newly-established chair of chemistry at the Royal Institution. It was while in this office that he made most of his great electrical discoveries. His communications to the *Philosophical Transactions* have been published separately in three vols. (1839, 1844, 1855). In 1832 he received the honorary degree of D. C. L. from Oxford, was made an honorary member of the Academy at Berlin, with many other honors too numerous to mention. In 1835 he received a pension of £300 a year from Lord Melbourne. He died Aug. 25, 1867. As an experimentalist Faraday was considered the very first of his time. As a popular lecturer he was equally distinguished, and used to draw crowds to the Friday evening lecture at the Royal Institution. Among his published works we may mention the following:—*Researches in Electricity* (1831-55), *Lectures on Non-metallic Elements* (1853), *Lectures on the Forces of Matter* (1860), *Lectures on the Chemical History of a Candle* (1861).

Faradization (far-a-dī-zā'shun), the medical application of the magneto-electric currents which Faraday discovered in 1837.

Farâfra (fâ-rä'frâ), the name of one of the Egyptian oases in the Libyan desert.

Farallones (fä-râl-yō'nēz), a group of small islands in the Pacific, about 30 miles from the entrance to the Bay of San Francisco.

Farandola (far-an'dō-la), an exciting dance popular amongst the peasants of the south of France and the neighboring part of Italy. The men and women, placed alternately and facing different ways, form a long line winding out and in with a waving motion.

Farce (fars), a dramatic piece of low comic character. It is grotesque and extravagant rather than artistically humorous.

Farcy (far'si), a disease to which horses are liable, intimately connected with glanders, the two diseases generally running into each other. It is supposed to be a disease of the absorbents of the skin, and its first indication is generally the appearance of little tumors called farcy buds on the face, neck, or inside of the thigh.

Fardel-bound (fär'del), a term applied to cattle and sheep affected with a disease caused by the retention of food in the maniplies or third stomach, between the numerous plaits of which it is firmly impacted. Overripe clover, vetches, or rye-grass is liable to produce the disease.

Fareham (fär'am), a town of England, in Hampshire, at the northwest extremity of Portsmouth harbor, giving name to a parl. div. of the county. It has building-yards, potteries, and brickworks, and a considerable trade. Pop. (1911) 9674.

Farel (far'al), GUILLAUME, one of the earliest and most active of the Swiss reformers, was born in 1489 in Dauphiny, and at an early period was led by his intercourse with the Waldenses to adopt similar views. After preaching in various parts of Switzerland, he came to Geneva, where he was so successful at the religious conferences of 1534 and

1535 that the council formally embraced the Reformation. He was instrumental, also, in persuading Calvin to take up his residence in Geneva. An attempt on the part of the two reformers to enforce too severe ecclesiastical discipline was the cause of their having to leave the city in 1538. Farel took up his residence at Neufchâtel, where he died in 1565.

Farewell (fâr-wel'), CAPE, a cape at the southern extremity of Greenland.

Fargo (fâr'gō), a city of Cass County, North Dakota, on the Red River of the North and the Great Northern Railroad, 254 miles W. of Duluth. It has iron, wire fence, flour and other manufactures, and is the seat of the State Agricultural and Fargo Colleges. Pop. 14,331.

Faria y Sousa, MANUEL, a Portuguese historian and poet, born in 1590, of an ancient and illustrious family; died about 1649.

Faribault (fâr'i-bō, far-i-bō), a city capital of Rice County, Minnesota, 53 miles S. of St. Paul. It has woolen and furniture factories. Its buildings include the State asylum for the deaf, dumb, and blind, and an Episcopal divinity college. Pop. 9001.

Faridpur (fâ-rēd-pör'). a district of India, in the Dacca Division of Bengal; area 2267 sq. milcs. Chief town, Faridpur, on the Marâ Padmâ. Pop. 11,649.

Farina (fa-rī'na, fa-rē'na), a term given to a soft, tasteless, and commonly white powder, obtained by trituration of the seeds of cereal and leguminous plants, and of some roots, as the potato. It consists of gluten, starch, and mucilage.

Farinelli (fâr-i-nel'ē), CARLO, an Italian singer, born at Naples in 1705. His true name was Carlo Broschi, and to develop his vocal powers he was made a eunuch. He sung in Vienna, Paris, and London with the greatest success. On visiting Spain, where he intended only a brief sojourn, he found King Philip V plunged in a profound melancholy. He succeeded in rousing him from it by the powers of his voice, and became his prime favorite and political adviser. But the penalty of his advancement was that for ten years he had to sing every night to his royal master the same four airs. On his return to Italy, in 1762, he found himself almost forgotten, but continued to exercise a splendid hospitality in his country house, near Bologna. He died in 1782.

Faringdon (far'ing-don), a market town of England, county of Berks, 16 miles southwest of Oxford. Pop. about 3000.

Farini (fa-rē'nē), LUIGI CARLO, an Italian statesman and author, born in 1812. He studied medicine at Bologna, and practiced as a physician. He became known as a nationalist and patriot in the political movements of 1841, had to leave the country for a time, but returned and was made a member of the Reform Ministry at Rome during the disturbances of 1848. Disapproving equally the views of the old Conservative and the extreme Republican party, he went to Piedmont, where he was elected a deputy, and fought with great energy both in literature and in parliament on behalf of Cavour and the Piedmontese Constitutionalists. After the peace of Villafranca he was chosen dictator of the duchies of Parma and Modena, and was mainly instrumental in inducing them to unite with the Piedmontese monarchy. His *History of the Papal States from 1814 to 1850* is a well-known work. In 1862 he became president of the ministry. He lost his reason in 1863, and died in 1866.

Farjeon (fâr'je-on), BENJAMIN LEOPOLD, novelist, born in England in 1833; died in 1903. For some years he was a journalist in Australia and New Zealand. He wrote *London's Heart, Grif, Toilers of Babylon*, etc., novels that had a style approaching that of Dickens.

Farmers' Alliance, an association of agriculturists in the United States which originated in Texas in 1873, in a coöperative effort against the depredations of cattle thieves. With increase of membership its purposes widened, and kindred societies were formed in other states, a general consolidation of the various societies being made in 1889 under the title of National Farmers' Alliance and Industrial Union. Its purposes were largely political, and out of it grew in 1892 the People's or Populist party, which for a decade had an active political career. The original association continued as a non-political organization, and is at present in active existence in the Southern and most of the Western States. A parallel organization, formed in Chicago in 1880, and also called the National Farmers' Alliance, extends over many of the Northern States.

Farmers-general (French, *Fermiers généraux*), private contractors, to whom under the old French monarchy was let out the collection of various branches of the revenue, poll-tax, duties on salt and tobacco,

customs, etc. These contractors made enormous profits on the farming of the public revenues. A revenue collected in this way not only imposed a much heavier burden on the people, but the merciless rigor of irresponsible and uncontrolled exactors subjected them to hardships and indignities to which they could not submit without degradation. In 1790 the system was suppressed by the constituent assembly.

Farming. See *Agriculture.*

Farne (färn; or FERNE) ISLANDS, a group of islets of England, in the German Ocean, off the north coast of Northumberland, 2 miles E. by S. of Bamborough Castle, and separated from the mainland by a channel of about 1¾ miles. They have been the scene of several disastrous shipwrecks.

Farnese (fär-nā'sā), an illustrious family of Italy, whose descent may be traced from about the middle of the thirteenth century, and which gave to the church and the Republic of Florence many eminent names, amongst which the following may be mentioned: PIETRO FARNESE (died 1363), a general of the Florentines in the war against Pisa; ALESSANDRO, who became Pope as Paul III (1534-49), and whose gifts to his natural son Pier Luigi of the duchies of Parma and Piacenza laid the foundation of the wealth and greatness of the family; OTTAVIO (1520-85), son and successor of Pier Luigi, spent a long and peaceful reign in promoting the happiness of his subjects. ALESSANDRO (1546-92), elder son of Ottavio, became famous as a most successful general of the Spaniards in the wars with the Netherlands and France. RANUZIO (1569-1622), son of Ottavio, was a gloomy and suspicious tyrant. The line became extinct with Antonio in 1731. The name of the Farnese is associated with several famous buildings and works of art. The *Farnese Palace*, at Rome, was built by Pope Paul III while he was cardinal by Sangallo and Michael Angelo. It is now the residence of the dethroned Bourbon dynasty of Naples. Its sculpture gallery was formerly very celebrated, but the best pieces have been removed to Naples, including the following: The *Farnese Bull*, a celebrated ancient sculpture representing the punishment of Circe, discovered in the sixteenth century in the Baths of Caracalla at Rome; *Farnese Hercules*, a celebrated ancient statue of Hercules by Glycon, found in the Baths of Caracalla in 1540; *Farnese Flora*, a colossal statue of great merit, found in the Baths of Caracalla; *Farnese Cup*, an antique onyx cup, highly ornamented with figures in relief.

Farnham (färn'am), a town of England, county of Surrey, 3 miles S. W. of Aldershot; a well-built place. North of the town is Farnham Castle, the residence of the bishops of Winchester. The staple trade is in hops. Pop. (1911) 7365.

Farnworth (färn'wurth), a manufacturing township of Lancashire, England, 3 miles from Bolton. Pop. (1911) 28,142.

Faro (fä'rō), a seaport of Portugal, prov. of Algarve, 62 miles S. E. of Cape St. Vincent. It is surrounded by Moorish walls, and has a convenient harbor. Its trade is considerable. Pop. 11,789.

Faro (fä'rō), a promontory forming the northeast point of Sicily at the entrance to the Strait of Messina. The point is strongly fortified, and on it there is a lighthouse 200 years old.

Faro, or PHARO (fär'ō), a game of hazard at cards, played chiefly in gambling establishments, and in which the player plays against the bank, represented by a professional faro-banker.

Faroe Islands (fä'rō, Danish *Färöer*, 'Sheep Islands'), a group of islands in the North Atlantic, lying between Iceland and Shetland. They belong to Denmark, and are twenty-five in number, of which seventeen are inhabited. The islands generally present steep and lofty precipices to the sea. Barley is the only cereal that comes to maturity; turnips and potatoes thrive well. There is no wood, but plenty of excellent turf, and also coal. The inhabitants are chiefly engaged in fishing and the rearing of sheep. Thorshavn, in Strömö, the largest island, is the seat of government. Pop. 15,230.

Farquhar (fär'kär), GEORGE, a comic writer of eminence, was born at Londonderry, in 1678. He tried the stage as an actor at Dublin, but soon left it to write plays for the London theaters. His first production was *Love in a Bottle*, performed at Drury Lane with great success in 1698. *The Constant Couple, Sir Harry Wildair, The Inconstant, the Recruiting Officer*, and *The Beaux' Stratagem* (reckoned his masterpiece) followed during the next six years. He died in 1707. Farquhar's wit is genuine, and his characters drawn from nature; but his plays have the licentious taint of the time.

Farragut (far'a-gut), DAVID GLASGOW, admiral of the United States Navy, was born near Knoxville, Tennessee, July 5, 1801, and entered the

navy as a midshipman when only ten years of age. In 1821 he was promoted to a lieutenancy, and was actively engaged in his profession until 1851, when he was appointed assistant inspector of ordnance. In 1855 he received a commission as captain. In 1861 he was assigned to go with the expedition against New Orleans, undertaken on the formation of the Confederacy, and sailed in February of the following year. New Orleans surrendered to the combined attack of the land and naval forces on 25th April, and Farragut proceeded to Vicksburg, which he safely ran past. In consequence of his success at New Orleans he was promoted to the rank of rear-admiral. In 1863 Farragut attempted to pass the batteries at Port Hudson, but was unsuccessful. In August, 1864, he attacked the Confederate fleet in the bay of Mobile, and forced it to surrender, thus making the fall of Mobile merely a question of time. July 25, 1866, he was made admiral, a grade which had not previously existed in the United States Navy. He died in 1870.

Farrakhabad (fa-rak'hä-bäd). See *Farukhabad.*

Farrant (far'ant), RICHARD, one of the earliest English composers of music. Very little is known of his history. He was a gentleman of the chapel royal in 1564, and subsequently organist and choirmaster. He is supposed to have died about 1580. His music, which is ecclesiastical, is distinguished by purity, simplicity, tenderness, and elevation. The anthems *Call to Remembrance,* and *Hide not Thou Thy Face,* composed by him, are well known and highly esteemed.

Farrar (far'ar), FREDERICK WILLIAM, theologian, was born in Bombay, 1831; graduated at Cambridge 1854; was assistant master at Harrow in 1855, master of Marlborough College in 1871, archdeacon of Westminster 1883. He published several popular theological works and works of fiction, and became known as a popular lecturer. He was Bampton Lecturer in 1885. Among his principal works are: *The Life of Christ* (1874), *Life of St. Paul* (1879), *The Early Days of Christianity* (1882), and *Lives of the Fathers* (1889). He died in 1903.

Farrer, HENRY, artist, born at London in 1843; died in 1903. He removed to New York in his youth and spent the remainder of his life in that city. He made a specialty of etching and water colors, and some of his landscapes are of surpassing beauty. He served as secretary of the American Water Color Society and president of the New York Etching Club. Among his Paintings are *The Old Homestead, A Windy Day, Sweet Restful Eve, Autumn,* etc.

Farrer, THOMAS CHARLES, painter, born at London in 1838. He studied drawing in a free school founded by Mr. Ruskin, and in 1858 came to New York, where he became a very successful teacher of art. He served on the Federal side in the Civil war and returned to England in 1869. His teachings exercised a notable and wholesome effect upon American art.

Farriery (far'i-e-ri). See *Veterinary Art.*

Farringdon (far'ring-don). See *Faringdon.*

Fars (färs), or FARSISTAN (fär-si-stän'), a maritime province in the southwest of Persia, abutting on the Persian Gulf. It is mountainous, but has many rich and well-cultivated districts. The most important products are grain, fruit, wine, oil, cotton, tobacco, silk, cochineal, and attar of roses. The manufactures include woolen, silk, and cotton goods; and in these and other articles an active trade is carried on chiefly with Hindustan. Pop. estimated at 1,700,000.

Farsan (fär-sän'), two islands on the east side of the Red Sea on the coast of Yemen, called respectively Farsan Kebîr and Farsan Segîr.

Farthing (fär'thing), the fourth part of a penny, the modern form of the Anglo-Saxon *feorthung,* the fourth part of anything. Until the time of Edward I a penny was the lowest coin, though John had issued a farthing for use in Ireland. Silver farthings were employed up to the reign of Edward VI, those of copper being first put into currency by Charles II in 1672, the old 'token' farthings being thus replaced.

Farukhabad, or FARRUKHABAD (far-*ak*-ä-bad'), a city in the Northwest Provinces of British India, 2 or 3 miles from the Ganges, a handsome well-built town, with avenues of trees in many of its streets. Pop. 67,338. The district has an area of 1720 square miles and forms part of the Doab. It is watered by branches of the Ganges canal. Pop. 925,812.

Fasano (fä-zä'nō), a town of South Italy, prov. of Bari. Pop. 16,848.

Fasces (fas'sēz), among the ancient Romans, a bundle of polished rods, in the middle of which was an axe, carried by lictors before the superior magistrates.

Fascia (fas'si-a, fash'i-a; Lat. a bandage), in anatomy signifies a thin, tendinous covering which surrounds the muscles of the limbs and binds them in their places.

Fascination (fas-i-nā'shun), the exercise of an overpowering and paralyzing influence upon some animals attributed to certain snakes corresponding somewhat to the so-called evil eye among human beings. Squirrels, mice, and the smaller birds are said to be the most subject to this power; but the fact is far from clearly explained, and is not perhaps even sufficiently demonstrated. Most of the accounts agree in describing the animal fascinated as having a painful consciousness of its danger, and the power exercised over it, but to be unable to resist the desire to approach the fascinator. Some have endeavored to explain this power as the effect of narcotic emanations from the serpent which stupefy the weaker animal. Others regard it as bearing a striking analogy to the mesmeric influence which one human being sometimes has over another.

Fascines (fas-sēnz'), in the military art, bundles of boughs or rods from 6 to 18 feet in length and usually 1 foot in diameter, used in raising batteries, strengthening parapets, riveting slopes, etc. The twigs are drawn tightly together by a cord, and bands are passed round them at the distance of 2 feet from each other. Very long thin ones are called *saucissons* or *battery-sausages*.

Fashion (fash'un), the prevalent style in dress and usages which society from time to time adopts and imposes by a sort of arbitrary law upon its members. In its less important details the law of fashion varies considerably, and is often little more than a play of caprice. On its better side it is an endeavor to embody in general and recognized forms the best judgment as to what is decorous and of good taste and feeling in the varying and often delicate situations which occur, where large and mixed companies are in the habit of meeting together. The circle of fashion is not necessarily coincident with that of gentility. A man may be of noble birth, wealthy, and distinguished without being fashionable.

Fashoda (fa-shō'dà), a large town built by the Egyptians in 1867 on the banks of the Nile in the Soudan, N. lat. 10°. It gives its name to that portion of the district. Since 1884 it has been in ruins, the Mahdi overthrowing Egyptian rule in that year. In 1898 Marchand, a French adventurer, hoisted the French flag there after a journey through Africa, but General Kitchener, the Anglo-Egyptian Sirdar, after defeating the Mahdi, marched to Fashoda, arriving shortly after Marchand, and after diplomatic negotiations the French withdrew.

Fasti (fas'tī; L.), among the Romans, registers of various kinds; as *fasti sacri*, calendars of the year, giving the days for festivals, courts, etc., being a sort of almanac.

Fasting (fast'ing), the partial or total abstinence of mankind and animals from the ordinary requisite supply of aliment, by which it is to be understood that quantity which is adapted to preserve them in a healthy and vigorous condition. It would appear that various warm-blooded animals are capable of sustaining total abstinence much longer than human beings. Cats and dogs have survived for several weeks without nourishment of any kind, but it is probable that few human beings could survive such deprivation for more than a week, though there have been examples of much longer abstinence from food. The use of water without solid food enables life to be sustained much longer than it could otherwise be.

Fasts, temporary abstentions from food, especially on religious grounds. Abstinence from food, accompanied with signs of humiliation and repentance or grief, is to be found more or less in almost all religions. Among the Jews fasts were numerous, and we find many instances of occasional fasting in the Old Testament. Herodotus says that the Egyptians prepared themselves by fasting for the celebration of the great festival of Isis. So in the Thesmophoria at Athens, and in the rites of Ceres at Rome, it was practiced. The Church of Rome distinguishes between days of fasting and of abstinence. The former are: 1, the forty days of Lent; 2, the Ember days, being the Wednesday, Friday, and Saturday of the first week in Lent, of Whitsun week, of the third week in September, and of the third week in Advent; 3, the Wednesdays and Fridays of the four weeks in Advent; 4, the vigils or eves of Whitsuntide, of the feasts of St. Peter and St. Paul, of the Assumption of the Virgin, of All Saints, and of Christmas day. When any fasting day falls upon Sunday it is observed on the Saturday before. The Greek Church observes four principal fasts: that of Lent, one beginning in the week after Whitsuntide, one for a fortnight before the Assumption, one forty days before Christmas. In the East, however, the strict

idea of a fast is more preserved than in the West. The Church of England appoints the following fixed days for fasting and abstinence, between which no difference is made:—1, the forty days of Lent; 2, the Ember days at the four seasons; 3, the three Rogation days before Holy Thursday; 4, every Friday except Christmas day. The church, however, gives no directions concerning fasting.

Fat, an oily, concrete substance, a compound of carbon, hydrogen, and oxygen, deposited in the cells of the adipose or cellular tissue of animal bodies. In most parts of the body the fat lies immediately under the skin. Fat is of various degrees of consistence, as in tallow, lard, and oil. It is generally white or yellowish, with little smell or taste. It consists of two substances, stearin and elain or olein, the former of which is solid, the latter liquid. These elements are separated by pressing the fat between folds of bibulous paper, which absorbs the liquid or oil. By after-treatment with water the oil is separated from the paper. Fats are insoluble in water. Sodium borate is used to secure a mixture of fat and water, as in the making of cold cream. When boiled with caustic alkalies fats are decomposed (saponification), yielding an alkaline salt of the fatty acid (soap) and glycerin. Human fat appears to contain no stearin, but margarin and olein. It is an excellent packing material in the body, and gives the human frame its smooth, rounded contour. Being a bad conductor of heat, it is useful in retaining warmth, but its chief function is that of a nutritive reserve.

Fatalism (fā'tal-izm), the belief in fate, or an unchangeable destiny, to which everything is subject, uninfluenced by reason, and pre-established either by chance or the Creator. Amongst notable historical examples of the belief in fate may be mentioned the old Greek conception of a fate which stood behind the gods themselves as a controlling power; the Mohammedan fatalism, which regards all things great and small as inexorably predetermined, so that no accident is possible; the theological doctrine of predestination amongst Calvinists. See *Predestination.*

Fata Morgana (fā'ta mor-gā'na), a name given to a very striking optical illusion which has been principally remarked in the Strait of Messina, between the coasts of Sicily and Calabria—a variety of mirage (which see). The images of men, houses, towers, palaces, columns, trees, etc., are occasionally seen from the coast, sometimes in the water and sometimes in the air or at the surface of the water. The same object has frequently two images, one in the natural and the other in an inverted position. The images of a single object are said to be sometimes considerably multiplied.

Fategarh (*fat-e-gar'*), a town of the Northwest Provinces of India, 3 miles from Farukhabad, the scene of a massacre of upwards of 200 Europeans during the mutiny of 1857. It is now a suburb of Farukhabad.

Fatehpur (*fat-e-pör'*), an Indian town in a district of the same name, Allahabad division, Northwest Provinces. 50 miles S. E. of Cawnpore. Pop. 19,281. The district has an area of 1639 sq. miles.

Fatehpur Sikri, an Indian town, district of Agra, Northwest Provinces. It was the favorite residence of the Emperor Akbar, who enclosed and fortified it. It now chiefly consists of a vast expanse of magnificent ruins enclosed by a high stone wall some 5 miles in circuit. Pop 7147.

Fates (fāts; in Latin, *Parcæ,* in Greek, *Moirai*), in Greek and Latin mythology, the inexorable sisters who spin the thread of human life. The appellation *Clotho* (the spinner) was probably at first common to them all among the Greeks. As they were three in number, and poetry endeavored to designate them more precisely, *Clotho* became a proper name, as did also *Atropos* and *Lachesis.* Clotho means she who spins (the thread of life); Atropos signifies unalterable fate; Lachesis, lot or chance; so that all three refer to the same subject under different points of view. They know and predict what is yet to happen. Lachesis is represented with a spindle, Clotho with the thread, and Atropos with scissors, with which she cuts it off. We find also in the northern mythology three beautiful virgins, the *Nornen,* who determine the fate of men. Their names are *Urd* (the past), *Varande* (the present), and *Skuld* (the future).

Fatherlasher (fa'ther-lash-er), a fish of the genus *Cottus* or bullhead (*Cottus bubalis*), from 8 to 10 inches in length. The head is large, and is furnished with several formidable spines. The fish is found on the rocky coasts of Britain, and near Newfoundland and Greenland. In the latter regions it attains a much larger size, and is a considerable article of food.

Fathers of the Church, or CHRISTIAN FATHERS. See *Church, Fathers of the.*

Fathom (fath'um), a unit of length equal to 6 feet. It is chiefly used by sailors, who measure soundings, etc., in fathoms.

Fatigue (fa'tēg) OF MATERIALS, injury to materials used in building or other purposes from strains or stresses exceeding the elastic limit of resistance. If, for instance, a bar of iron has an elastic limit of 20,000 lbs. per sq. inch and a breaking capacity of 50,000 lbs., and is subjected to stresses greater than 20,000 lbs., a molecular change will gradually take place in it, brittleness will supervene, and it may break at a pressure as low as 30,000 lbs. The factor of safety is, therefore, fixed by engineers within the elastic limit.

Fatimite Dynasty (fat'i-mīt), a line of caliphs claiming descent from Fatima, the favorite daughter of Mohammed, and of Ali her cousin, to whom she was married. In the year 909 Abu-Mohammed Obeidalla, giving himself out as the grandson of Fatima, endeavored to pass himself off as the Mahdi or Messiah predicted by the Koran. Denounced as an impostor by the reigning Caliph of Bagdad, he fled into Egypt, became Caliph of Tunis, and soon conquered all Northern Africa from the Straits of Gibraltar to the borders of Egypt. His son wrested Egypt from the Abbasides in 970 and founded Cairo. The Fatimite dynasty was extinguished on the death of Adhed, the fourteenth caliph, and a new line began with Saladin.

Fatty Acids, a name given to such acids as have been separated from fats. Fats and fixed oils are composed of one or more acids combined with the radical glycyl. By boiling with potash or soda the fat is decomposed, glycerin and a soap being the products. By treating this soap with hydrochloric or sulphuric acid the base is removed and the fatty acid obtained free. These acids are such as butyric, caproic, stearic, margaric, palmitic, pelargonic, valerianic, acetic, etc. Formic acid has also been included in the fatty series of acids, as it belongs to the same order as those named.

Fatty Degeneration, an abnormal condition found in the tissues of the animal body, in which the healthy protoplasm is replaced by fatty granules. It is a sign of defective nutrition, and is common in old age, affecting the muscles, the heart, arteries, kidneys, etc. It is accompanied by great muscular flabbiness, weakness, and want of energy, the sufferer looking at the same time fat and comparatively well.

Fatty Infiltration, a condition in which fat gets within the tissue cells, pushing aside the protoplasm and occupying its space. It is found in some who are inclined to obesity.

Fatty Tissue, in anatomy, the adipose tissue, a tissue composed of minute cells or vesicles, having no communication with each other, but lying side by side in the meshes of the cellular tissue, which serves to hold them together, and through which also the blood-vessels find their way to them. In the cells of this tissue the animal matter called fat is deposited.

Fatuity (fa-tū'i-ti). See *Insanity.*

Fatwa (fat'wâ), a town of Bengal, Patna District, 8 miles from Patna city, at the junction of the Punpun with the Ganges. Pop. 10,919.

Faubourg (fō-bör), a suburb of French cities; the name is also given to districts now within the city, but which were formerly suburbs without it. Thus the *Faubourg St. Germain* is a fashionable quarter of Paris in which the ancient nobility resided.

Fauces (fą'sēs; Lat. 'jaws'), in anatomy, the posterior part of the mouth, terminated by the pharynx and larynx.

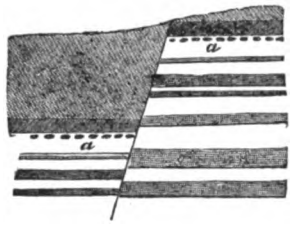
Faucet (fą'set), a form of valve or cock in which a spigot or plug opens or closes a part of a pipe for the passage of liquid.

Faucigny (fō-sē-nyē), a district of France, department of Haute Savoie, one of the loftiest districts of Europe, being partly traversed by the Pennine Alps.

Faucit (fą'sit), HELEN, LADY THEODORE MARTIN, was born in 1816, the daughter of Mrs. Faucit, the actress. She made her *début* at the Theater Royal, Richmond, in 1833, as Juliet in *Romeo and Juliet.* She first appeared in London at Covent Garden as Julia in *The Hunchback,* in which she gained a decided success. She was one of the most important members of Macready's company during the Shaksperean revivals of 1837, and was subsequently the original representative of the heroines in Lord Lytton's *Lady of Lyons, Money, Richelieu,* etc., and in Browning's *Strafford,* and *Blot on the Scutcheon,* and Colombe's *Birthday.* She married Mr. Martin (afterward Sir Theodore), and later was the authoress of a volume *On Some of Shakespere's Female Characters.* Died 1898.

Fault (fąlt), in geology, a fracture of strata, accompanied by a

sliding down or an upheaval of the deposits on the one side of the fracture to a greater distance than the other. Faults are frequently met with in coal beds, the miner coming unexpectedly upon an abrupt wall of other strata. The angle this makes with the plane of the bed he



is working indicates whether he must look up or down for its continuation on the other side of the fracture. In mines these faults often serve for natural drains. The cut above shows at *a a* the change of position in strata caused by a fault.

Faun (fạn), one of a kind of rural deities or demigods believed in among the Romans, inhabiting the forests and groves, and differing little from satyrs. Their form was principally human, with a short goat's tail, pointed ears, and projecting horns; sometimes also with cloven feet. There are some famous antique statues of fauns, the *Dancing Faun* at the Uffizi in Florence (restored by Michael Angelo), the *Dancing Faun* at Naples, the *Faun* (of Praxiteles?) at the Capitoline Museum, Rome, the *Sleeping Faun*, etc.

Fauna (fạ'na; from faun, *which* see), a collective word signifying all the animals of a certain region, and also the description of them, corresponding to the word *flora* in respect to plants.

Faure (fôr), FRANÇOIS FÉLIX, statesman, born at Paris, France, in 1841; died 1899. He commanded a body of volunteers during the Franco-German war, and won the ribbon of the Legion of Honor. He was elected to the Assembly in 1881, served in several successive cabinets, and was chosen president of the French Republic in 1895.

Faust (foust), DOCTOR JOHN, a celebrated devotee of the black art, who lived in Germany early in the sixteenth century. According to some accounts he was born in Suabia, others make him a native of Anhalt, others of Brandenburg. In his sixteenth year he went to Ingolstadt and studied theology, became in three years a *magister*, but abandoned theology, and began the study of medicine, astrology, and magic, in which he likewise instructed his familiar Johann Wagner, the son of a clergyman at Wasserburg. After Dr. Faust had spent a rich inheritance, he, according to tradition, made use of his power to conjure up spirits, and entered into a contract with the devil for twenty-four years. A spirit called *Mephistopheles* was given him as a servant, with whom he traveled about, enjoying life in all its forms, but the evil spirit finally carried him off. Even yet Dr. Faustus and his familiar Wagner play a conspicuous part in the puppet-shows of Germany, and the legend forms the subject of Goethe's great drama *Faust*, and furnishes the libretto for Gounod's famous opera of the same name. As early as 1590 the legend was dramatically treated in England by Christopher Marlowe.

Fausta (fous'ta), FLAVIA MAXIMIANA, daughter of Emperor Maximinian, married in 307 A.D. to Constantine the Great. She was murdered by her husband's orders in 326 A.D.

Faustina (fous-ti'na), the name of two Roman empresses: (1) Annia Galeria Faustina (died A.D. 141), the wife of the Emperor Antoninus Pius; and (2) her daughter, who was married to the Emperor Marcus Aurelius (died A.D. 175). Both were accused of dissolute conduct.

Favart (fà-vär), CHARLES SIMON, creator of the serio-comic opera in France, was born in 1710, the son of a pastry cook. His poetical reputation rests principally on his numerous productions for the *opéra aux Italiens* and the comic opera. He was the director of a company of itinerant actors which followed Marshal Saxe into Flanders. His wife, Madame Favart, was a famous singer, comic actress, and dancer, and participated in the composition of her husband's plays. Favart died in 1792.

Faversham (fav'er-sham), a seaport of England, County Kent, on a branch of the Swale, giving name to a parl. div. of the county. It is a very ancient place, and has manufactures of brick, cement, and gunpowder. Faversham Creek is navigable up to the town for vessels of 200 tons. Pop. (1911) 10,619.

Favre (fävr), JULES, a French politician, born in 1809, at Lyons. He studied law, and after distinguishing himself at the Lyons bar, came to Paris in 1835, where he became famous as a defender of political prisoners. On the outbreak of the revolution of 1848 he became secretary to Ledru-Rollin. He

was a leader of the party of opposition to the President Louis Napoleon; and after the *coup d'état* (1851) he retired from political life for six years, till in 1858 his defense of Orsini for the attempt on the life of the emperor again brought him forward. From this time he again became an active leader of the Republican opposition to the emperor. On the fall of the empire he became Vice-president of the Government of National Defense and Minister of Foreign Affairs. As such he conducted the negotiations for peace with Prince Bismarck. He died in 1880.

Favrile (fav-ril'), a highly decorative, colored, enameled and iridescent glass, usually in vase forms. See *Tiffany, Louis Comfort.*

Favus (fā'vus), crusted or honeycombed ringworm, a disease chiefly attacking the scalp, and characterized by yellowish, dry incrustations. It is produced by a fungous growth.

Fawcett (fą'set), EDGAR, poet and novelist, born in New York, in 1847; died in 1904. He devoted himself to literary pursuits in New York and afterwards in London. He wrote *Songs of Doubt and Dream, Purple and Fine Linen, An Ambitious Woman, The New Hero,* and other novels; *Agnosticism and Other Essays,* and some successful plays.

Fawcett, HENRY, an English politician and economist, born at Salisbury in 1833. He was educated at Cambridge, studied law for a while at the Middle Temple, but soon renounced it. In 1858, when out partridge shooting, he met with an accident which inflicted on him total blindness. Undiscouraged, however, by his deprivation he gave his attention to economic studies. In 1863 he was elected to the chair of political economy at Cambridge. In 1865 he was elected M. P. for Brighton, which he represented till the general election of 1874, when he was elected for Hackney. He became postmaster-general in the second Gladstone administration, and effected many reforms in his department. In 1883 he was made Lord Rector of Glasgow University. He died Nov. 6, 1884. Amongst his principal writings are: *A Manual of Political Economy, Lectures on the Economic Position of the British Laborer,* and articles on Indian finances.—His wife, MILLICENT GARRETT FAWCETT, shared her husband's studies, and has published a work, *Political Economy for Beginners,* which is an abridgment of her husband's larger works. She is also known as a prominent advocate of all measures for the educational and political advancement of women.

Fawkes (fąks), GUY. See *Gunpowder Plot.*

Fayal (fī-ȧl'), an island belonging to Portugal, one of the Azores. It is of a circular form, about 10 miles in diameter. The climate is good, and the air always mild and pure. The soil is very fertile, producing in abundance wheat, maize, flax, and almost all the fruits of Europe. It exports a great quantity of oranges and lemons. The chief place is Villa Horta or Orta. Pop. 22,262.

Fayence. See *Faïence.*

Fayette, GENERAL LA. See *Lafayette.*

Fayette, MARIE MADELEINE, COUNTESS DE LA. See *Lafayette.*

Fayetteville (fā'et-vil), a city, capital of Cumberland Co., North Carolina, on Cape Fear River, 53 miles S. of Raleigh. It has a large export trade and many cotton factories and other manufactories. Pop. 7045.

Fayoum (fä-yŏm'), a province of Middle Egypt, a little to the west of the Nile, surrounded by the Libyan desert; area about 800 square miles. The soil is alluvial, and, in the north particularly fertile. Fayoum is irrigated by canals coming from the Canal of Joseph, and that from the Nile, and is one of the most fertile provinces of Egypt. Here lay the ancient Labyrinth and the artificial lake Moeris. On the west lies Lake Birket-el-Kurun. The chief town, Medinet-el-Fayoum, is connected with Cairo by a railway. Pop. of province, 371,006.

Feasts (fēsts). See *Festivals.*

Feather-grass (feth'er-gras), the popular name of *Stipa pennāta,* a native of dry places in the south of Europe. The leaves are rigid, setaceous, grooved; the awns exceedingly long, feathering to the point. The Rush-leaved Feather-grass is found in prairies in the Western States.

Feather River, a tributary of the Sacramento River, California, rising in the Sierra Nevada range. Its length is about 250 miles.

Feathers (feth'erz), the form which the dermal appendages assume in birds agreeing in mode of development, but differing in form from hairs and scales. The feather consists of a stem, horny, round, strong, and hollow in the lower part, called the *quill,* and in the upper part, called the *shaft,* filled with pith. On each side of the shaft

is a web composed of a series of regularly-arranged fibers called *barbs*. The barbs and shaft constitute the *vane*. On the edges of the barbs are set the *barbules*, which interlock with those of adjacent barbs, and thus give strength to the vane. Feathers are generally divided into two kinds, quill feathers found in the wings and tail, and plumes or clothing feathers generally covering the remainder of the bird. The feathers of birds are periodically changed, generally once, but in some species twice a year. This is called *molting*. When feathers have reached their full growth they become dry, and only the tube, or the vascular substance which it contains, continues to absorb moisture or fat. When, therefore, part of a feather is cut off, it does not grow out again; and a bird whose wings have been clipped remains in that situation till the next molting season, when the old stumps are shed and new feathers grow out. If, however, the stumps are pulled out sooner (by which operation the bird suffers nothing), the feathers will be renewed in a few weeks or even days. The feather is a very strong formation, not readily damaged, the arch of the shaft resisting pressure, while the web and fine fibers yield without suffering. Being a bad conductor of heat, it preserves the high temperature of the bird, while it is so light as to be easily carried in flight. It is rendered almost impervious to wet by the oily fluid which most birds secrete at the base of the tail. Feathers form a considerable article of commerce, particularly those of the ostrich, heron, swan, peacock, goose, etc., for plumes, ornaments, filling of beds, pens, etc.

Feather-star *Comatŭla rosacĕa*, a beautiful crinoid starfish, consisting of a central body or disc, from which proceed five radiating arms, each dividing into two secondary branches, so that ultimately there are ten slender rays. Each arm is furnished on both sides with lateral processes so as to assume a feather-like appearance. It is fixed when young by a short stalk, but exists in a free condition in its adult state.

Febricula (feb-ri-kū'la), a short, feverish attack, of undetermined cause, lasting only for a few days. See *Fever*.

Febrifuge (feb'ri-fūj), a medicine employed to drive off or diminish fever, such as quinine, sweet spirit of niter, etc.

Febronianism (fe-brō'ni-an-izm), in Roman Catholic theology, a system of doctrines antagonistic to the admitted claims of the pope, and asserting the independence of national churches, and the rights of bishops to unrestricted action in matters of discipline and church government within their own dioceses. The term is derived from Justinus *Febronius*, a *nom de plume* assumed by John Nicholas von Hontheim, Archbishop of Trèves, in a work on the claims of the pope.

February (feb'rü-a-ri; from the Roman *Februa*, a festival of expiation or purification), the second month in the year, having twenty-eight days, except in leap year, when it has twenty-nine. This latter number of days it had originally among the Romans, until the senate decreed that the seventh month should bear the name of Augustus, when a day was taken from February and added to August to make it equal July in number of days.

Fécamp (fā-kän), a seaport of France, department of Seine-Inférieure, 23 miles northeast of Havre. It is one of the best ports in the Channel, and has many vessels employed in the cod, herring, and mackerel fisheries. Pop. (1906) 15,872.

Federal Farm Loan Act, passed by Congress in July, 1916, otherwise known as the Rural Credits Bill, has for its purpose to provide funds for agricultural development in the United States. Its object is to aid farmers by creating standard forms of investment based upon farm mortgages, to equalize rates of interest upon farm loans, and in this way to open a market for the United States bonds; also to create depositories and financial agents for the United States, and for other purposes connected with the farming interests of the country. For this purpose a Farm Loan Bureau has been organized, under the general supervision of a Federal Farm Loan Board, consisting of the Secretary of the Treasury and four other members appointed by the President. For this purpose, the continental area of the United States, including Alaska, has been divided into twelve districts, each to contain a Federal Land bank, empowered to loan money to farmers on mortgage on favorable terms of interest and repayment. No such loan is to exceed fifty per cent. of the value of the land mortgaged and twenty per cent. of that of the permanent improvements thereon. The interest to be paid in such loans is in no case to exceed six per cent. per annum.

To carry out the provisions of this law corporations, known as farm land associations, may be formed of those engaged or

desiring to engage in agriculture, their purpose being to secure funds from the farm loan banks for members of the associations and to take the necessary steps to comply with the requisite conditions upon which loans can be granted. The amount to be loaned to any individual is limited to $10,000 maximum and $100 minimum, and the terms of repayment of the mortgage are so arranged as not to be onerous to the borrower.

Federal Party (fed'er-al), a name assumed by that portion of the people of the United States who favored the adoption of the Federal constitution, organized the government and administered it during the first three presidential terms. They advocated a government having attributes of sovereignty, operating upon the people directly, and having all necessary powers for effective action; their opponents favored a simple compact of confederation. The party won no presidents after 1800, and vanished during the twenty years following.

Federal Reserve Board, a banking institution centralizing and co-ordinating the banking system of the United States. Originally this system was a highly disorganized one, the currency consisting of notes issued by State banks and destitute of Federal supervision or support. This was succeeded by the National Banking System, inaugurated during the latter part of the Civil War, and with a currency based upon Government bonds deposited in the Treasury, the bank notes being thus sustained by the governmental credit. It was, therefore, entirely successful as a basis of secure circulation, but as a banking system it gradually lost its usefulness, being destitute of an elasticity in times of monetary stress. It was long felt to be inadequate as a banking system, and much expert thought was given to the problem of how best to combine it into a single and self-working system. This led, in 1913, to the passage of a bill establishing a banking and currency system known as the Federal Reserve Act, approved by the President, December 23, 1913. Under this Act the United States is divided into twelve geographical divisions, within each of which is situated a reserve banking city, as a co-ordinating center of all the national banks of that division. These twelve cities, whose districts are numbered from 1 to 12, are the following: Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St. Louis, Minneapolis, Kansas City, Dallas and San Francisco.

Every National bank is required to become a stockholder in the Reserve bank of its district, and any State bank or trust company may also become a member bank of its district by complying with certain requisite conditions. There are at the present time nearly 8000 such member banks in the United States, the largest number, nearly 1000, being in the seventh or Chicago district. Each member bank is required to subscribe to the stock of the Federal Reserve bank of its district, to the amount of 6 p. cent. of its paid-up capital stock and surplus. The Reserve bank becomes thereby a mother bank and does not do business directly with the public, as banks usually do, but in an indirect way, through the agency of the member banks. It holds a certain proportion of the reserve funds of the member banks, and also may be made a depository for Government funds. It may secure from the Treasury Government notes known as Federal Reserve notes, and is authorized to issue these against commercial paper, with a minimum gold reserve of 40 per cent. There are nearly $200,000,000 of such notes in circulation. Besides this, these banks are granted certain powers of operation in the open market, such as the purchase of commercial paper, foreign exchange, etc., and, in a general way, perform the function of clearing houses between the member banks. In this way they serve to stabilize the member banks, possessing large capital funds which can be made use of for the public benefit in times of commercial disaster or panic conditions. They are competent to serve as central balance wheels in case of disastrous conditions of this kind. The whole system is under the supervision of a central Board in Washington, known as the Federal Reserve Board, and consisting of the Secretary of the Treasury, the Comptroller of the Currency, and five members named by the President with the approval of the Senate. The total capital of the twelve banks at present is about $112,000,000, and through their operation as central banking institutions the whole financial power of the government can in times of stress be utilized for the benefit of the country at large.

Federation of Labor, AMERICAN. See *Labor Organizations.*

Fee (fē), or FIEF (fēf), in law, primarily meant a loan of land, an estate held in trust on condition of the grantee giving personal or other service to the prince or lord who granted it. Feudal estates, however, soon came to

be regarded as inalienable heritages held on various tenures; hence the term fee came to be equivalent to an estate or inheritance—that is, an interest in land which passes to heirs if the owner die intestate. The amplest estate or interest in land is that of a *fee simple*, which is also called an absolute fee, in contradistinction to a fee limited or clogged with certain conditions. A fee simple means the entire and absolute possession of land, with full power to alienate it by deed, gift, or will. It is the estate out of which other lesser estates are said to be carved; such as a *fee tail* (see *Entail*), which is limited to particular heirs, and subject to certain restrictions of use; and a *base fee*, which ceases with the existence of certain conditions.

Feeble-minded, a class of mentally defective persons, not on the whole dangerous like the insane, though contributing largely to the criminal classes. The number of feeble-minded in institutions in the United States in 1905 was 15,318; in 1910, 20,731. The total number in the United States has been estimated at 150,000. The segregation of all feeble-minded in colonies where under supervision they can do a little farming or other manual labor, is advocated, or their sterilization to prevent them from reproducing.

Feeling (fēl'ing), properly a synonym for sensation, or that state of consciousness which results from the application of a stimulus to the extremity of some sensory nerve. It is the most universal of the senses, existing wherever there are nerves; and they are distributed over all parts of the body, though most numerous on such parts as the finger tips and the lines where skin and mucous membrane pass into each other. This universal distribution of feeling is necessary, otherwise parts of the body might be destroyed without our knowledge. The structures which thus comprehend the impressions of contact are papillæ or conical elevations of the skin in which the nerves end, and which are richly supplied with blood-vessels. The term feeling is also used for a general sense of comfort or discomfort which cannot be localized, and it is thus that the disturbances of internal organs often manifest themselves. In a figurative sense the term is also applied to a mental emotion, or even to a moral conception; thus we may speak of a friendly feeling, a feeling of freedom.

Felaniche (fel-ä-nē'chā), a town in the island of Majorca, a very ancient place, with Moorish remains. Pop. 11,294.

Felegyhaza (fā'led-yä-sä), a town of Hungary, 66 miles S. E. of Budapest, with large cattle-markets and an extensive trade in corn, wine, and fruit. Pop. 33,081.

Felidæ (fē'li-dē), animals of the cat kind, a family of *Carnivora* in which the predaceous instincts reach their highest development. They are among the quadrupeds what the *Falconidæ* are among the birds. The teeth and claws are the principal instruments of the destructive energy in these animals. The incisor teeth are equal; the third tooth behind the large canine in either jaw is narrow and sharp, and these, the carnassial or sectorial teeth, work against each other like scissors in cutting flesh; the claws are sheathed and retractile. They all approach their prey stealthily, seize it with a spring, and devour it fresh. The species are numerous in Europe, Asia, Africa, and America, but none are found in Australia. The family comprehends the lion, tiger, leopard, lynx, jaguar, panther, chetah, ounce, serval, ocelot, cat, etc.

TEETH OF FELIDÆ.

Skull and Teeth of the Tiger. *a*, Canines or tearing teeth. *b*, Incisors or cutting teeth. *c*, True molars or grinding teeth. *d*, Carnassial or sectorial teeth.

Felix (fē'liks), ANTONIUS or CLAUDIUS, procurator of Judea and freedman of the Emperor Claudius, is described by Tacitus as unscrupulous and profligate both in his public and private conduct. It was before this Felix that Paul's discourse (Acts xxiv, 25) was spoken. He was recalled A.D. 62, and narrowly escaped condemnation at Rome, on charges which the Jews had lodged against him.

Felix, MARCUS MINUCIUS, a distinguished Roman lawyer, who embraced Christianity, and wrote a defense of it in a dialogue entitled *Octavius*. The period when he flourished is uncertain; but Jerome is probably right in placing him about A.D. 230.

Fellah (fel'a), an Arabian word meaning 'peasant,' and used for the laboring class in Egypt. The fellahs or *fellaheen* constitute about three-fourths of the population of Egypt, and are mostly the direct descendants of the

old Egyptians, although both their language and religion are now that of their Arabian conquerors. They live in rude huts by the banks of the Nile, and have suffered much from overtaxation and oppressive rule. See *Egypt*.

Fellatah (fel-a'ta), FULBE, or FULAHS, a remarkable African race of the negro type, the original locality of which is unknown, but which is now widely diffused throughout the Soudan, where they are the predominant people in the states of Futa-Toro, Futa-Jalon, Bornu, Sokoto, etc. Though of the negro family, they have neither the deep jet color, the crisped hair, flat nose, nor thick lips of the negro. In person they are decidedly handsome, and mostly of a light copper color. They are shrewd, intelligent, and brave, and are mostly Mohammedans. Their influence is continually spreading.

Fellenberg (fel'en-burg), PHILIP EMANUEL VON, a Swiss educationalist, born in 1771. Having devoted himself to the social and intellectual improvement of the peasantry, he purchased the estate of Hofwyl, and established successively an institution for instructing the children of the poorer classes, a seminary for children in the higher grades of life and a normal school. The pupils were all trained to work in the fields or at the bench, and the product of their labor was sufficient to cover the expenses of their education. Fellenberg's scheme was ultimately so successful as to attract attention and imitation in other countries. He died in 1844, but the institutions established by him still exist in a modified form.

Fellows (fel'ōz), SIR CHARLES, traveler and antiquarian, was born in 1799 at Nottingham, England; died in 1860. He explored the valley of the Xanthus in Lycia, and discovered the remains of the cities Xanthus and Teos. His principal works are: *Travels and Researches in Asia Minor*, and *Coins of Ancient Lycia*.

Fellowship (fel'ō-ship), an honorable position in some universities, especially those of Oxford and Cambridge, which entitles the holder, called a fellow, to an annual stipend for a certain period. Fellowships in the English colleges commonly range in value from £100 to as much as £800 a year, and the right to apartments in the college, and certain privileges as to commons or meals. In American universities fellowships are regularly distinctions conferred to enable worthy students to pursue advanced graduate work, producing incomes varying from $100 to $1200.

Felo de se (fe'lō dē sē; Latin, 'a felon in regard to himself'), in law, a person that, being of sound mind and of the age of discretion, deliberately causes his own death. Formerly, in England, the goods of such a person were forfeited to the crown, and his body interred in an ignominious manner; but these penalties have been abolished.

Felony (fel'un-i), in law, includes generally all crimes below treason and of greater gravity than misdemeanors. Formerly it was applied to those crimes which entailed forfeiture of lands or goods as part of the punishment prescribed.

Fels, JOSEPH, an American single-tax reformer, born in Halifax C. H., Virginia, December 16, 1854; died February 22, 1914. He purchased 1300 acres at Hollesley Bay, England, to form a labor colony for unemployed, which has since been taken over by the government; also purchased 600 acres at Maylands, Essex, England, which was put under cultivation by small holders; was a supporter of the Fairhope Single Tax Colony at Mobile Bay, Alabama, and another colony at Arden, Delaware.

Felspar (fel'spär), FELDSPAR, a mineral widely distributed, and usually of a foliated structure, consisting of silica and alumina, with potash, soda, or lime. It is a principal constituent in all igneous and metamorphic rocks, as granite, gneiss, porphyry, greenstone, trachyte, felstone, etc. When in crystals or crystalline masses it is very susceptible of mechanical division at natural joints. Its hardness is a little inferior to that of quartz. There are several varieties, as common felspar or orthoclase, the type of an acid group containing from 7 to 16 per cent. of potash; albite and oligoclase, soda felspars, the quantity of soda exceeding that of lime; labradorite and anorthite, lime felspars, the quantity of lime in the latter amounting to 20 per cent.

Felt, a kind of cloth made of wool, or of wool and cotton united by rolling, beating, and pressure. The materials to be felted are carded and placed in a machine, where they are kept wet and intimately mixed together by a process of beating. Pressure then unites the whole into a compact mass. The use of felt as a material for hats, tents, cloaks, etc., is very ancient. For hat-making the fur of rabbits, beavers, raccoons and the wool of sheep are generally used. Felt, being a good non-conductor of heat, is much used for roofing, sheathing boilers, hot water reservoirs, etc. The

felt for such purposes is made from the coarsest woolen refuse from paper mills.

Feltre (fel'trā), a town in Northern Italy, about 44 miles N. N. W. from Venice. Pop. 5468; commune, 15,243.

Felucca (fe-luk'a), a long, narrow vessel, generally undecked, of light draught, and rigged with large lateen sails. They also carry from eight to twelve large oars. They are common in the Mediterranean.

Feme Covert (fem kuv'ert), in law, signifies a married woman, in contradistinction to a *feme sole*, or single woman.

Femern (fā'mėrn), an island of Prussia, province of Schleswig-Holstein, separated from the mainland by a shallow strait about 1 mile broad. The island has a fertile but marshy soil. The inhabitants are chiefly agriculturists and fishers. Pop. about 10,000.

Femgerichte, FEHMGERICHTE, or VEHMGERICHTE (fām'ge-ri*h*-te; from Old German, *fem*, punishment, and *gericht*, a court), criminal courts of Germany in the middle ages, which took the place of the regular administration of justice (then fallen into decay), especially in criminal cases. These courts originated and had their chief jurisdiction in Westphalia, and their proceedings were conducted with the most profound secrecy. They seem to have been a survival of old territorial jurisdictions which, on the general distraction and lawlessness prevalent after the fall of Henry the Lion (1182), acquired an extensive and tremendous authority. In process of time, however, they degenerated, and no longer confined themselves to law and precedent, so that the secrecy in which they enveloped themselves only served as a cloak to their criminal purposes. The flagrant abuse of their power brought about their fall. In 1461 various princes and cities of Germany, as well as the Swiss confederates, united in a league against them, but their influence was not entirely destroyed until an amended form of trial and penal judicature was introduced. The last Femgericht was held at Zell in 1568. The president of the secret tribunal was called the Freigraf, and was generally a prince or count. His associates, who concurred in and executed the sentence, were called *Freischöffen*. These were scattered through all the provinces of Germany, and recognized one another by certain signs and watchwords. They acknowledged the emperor as their superior, and for this reason generally made him one of their number at his coronation at Aix-la-Chapelle. The assemblies of the tribunal were open or secret. The former were held by day in the open air; the latter by night, in a forest or in concealed and subterranean places. In these different cases the circumstances of judgment and the process of trial were different. The crimes of which the secret tribunal usurped cognizance were heresy, sorcery, rape, theft, robbery, and murder. The accusation was made by one of the Freischöffen, who, without further proof, declared upon oath that the accused had committed the crime. The accused was now thrice summoned to appear before the secret tribunal, and the citation was secretly affixed to the door of his dwelling or some neighboring place; the accuser remained unknown. If, after the third summons, the accused did not appear, he was once more cited in a solemn session of the court, and if still contumacious, was given over to the Freischöffen. The first Freischöffe who met him was bound to execute the decree of the court. A dagger was left by the corpse to show that it was not a murder, but a punishment inflicted by one of the Freischöffen. That many judicial murders were perpetrated in this manner from revenge, interested motives, or malice may justly be imagined.

Femur (fē'mur), in vertebrate animals, the first bone of the leg, situated next the trunk of the body, and in man popularly called the thigh-bone.

Fen, a marsh or stretch of wet boggy land often containing extensive pools. The *Fens*, or the *Fen District*, is a special term for a marshy district of England, extending into the counties of Cambridge, Lincoln, Huntingdon, Northampton, Norfolk, and Suffolk. A great part of the district is known as Bedford Level. Much of the land has been reclaimed at vast expense. The soil of fen lands is generally black and rich to a depth of 2 or 3 feet, and with proper management in the matter of draining they will produce heavy crops of grass and corn. There are some fens around Boston, Mass.

Fences (fen'ses), continuous lines of obstacles artificially interposed between one portion of the surface of the land and another for the purpose of separation or exclusion. Live fences are made of hawthorn, holly, box, beech, etc.; dead fences of stone, wood, and in recent times of iron or wire. In agriculture fences are necessary both for restricting the tenant's own animals to their pasture and for protecting his land from straying animals. The general

erection of fences on farms is one of the improvements of modern agriculture.

Fencibles (fen'si-bls), a sort of local militia raised for defense in case of invasion, and not liable to be sent to serve out of the country. The term *volunteers* is now used for this kind of service. The State Fencibles of Philadelphia is an old and honorable body of local militia.

Fencing (fens'ing), the art of attack and defense with sword or rapier, no shield being used. It was in Italy in the sixteenth century that the skillful use of the small sword first became common. The art spread to Spain and then to France, where, on account of the prevalence of dueling, it was brought to a high degree of development. The small sword or rapier (which was adopted for dueling) has a point, but no edge, and therefore demands the highest degree of adroitness in its use. In the fencing schools the instrument adopted for exercise is called a foil; it has a guard of metal or leather between the handle and blade, which is made of pliant steel and has a button at the end in place of a point. The parries are made with the weapon itself by opposing the *forte* of the foil (*i. e.*, the strong part from the handle to the center) to the *feeble* of the adversary's foil (*i. e.*, to the part from center to point); the upper part of the body to the right is defended by the parry called *tierce*, the upper part to the left by the *carte*, and the lower part by the *seconde*. In all parrying care must be taken that in covering the side attacked the other side is not too carelessly exposed to the enemy. After every parry a return should be made with rapidity and decision. The fencer should rely more upon his sword hand for protection than upon his agility of leg; yet he must be active on his legs so as to advance, retreat, or lunge with effect. The knees should therefore be somewhat bent when the fencer is on guard, that he may be light and elastic in his movements. An attack may be made by the mere extension of the arm, or accompanied by a lunge, that is, by advancing the body, stepping forward with the right foot without moving the left. An *engagement* means the crossing of the blades; a *disengagement*, slipping your foil under the opponent's and then pressing in the opposite direction; *riposte*, the attack without pause by a fencer who has parried. Fencing with the broadsword differs essentially from that with the foil, as the former has an edge as well as a point, and is therefore meant to cut as well as thrust. According to the instructions of drillmasters there are seven cuts, with corresponding guards, and three thrusts. Cut *one* is a diagonal, downward cut at the left cheek of the adversary; cut *three* is delivered with an upward slope at the left leg, and cut *five* horizontally at the right side; cuts *two*, *four*, and *six* attack the right cheek, right side, and right leg, respectively; and cut *seven* is directed vertically at the head. Guards *one* and *two* defend the upper portion of the body, the sword sloping upwards in an opposite direction to the opponent's guards; *three* and *four* protect the legs, the sword sloping downwards; guards *five* and *six* defend the sides, when the sword is held vertically, point downwards; and guard *seven* protects the head, the blade meeting the enemy's almost at a right angle. Since the introduction of the bayonet, bayonet exercise has become an important department of fencing in the army. In handling the bayonet defensively the right foot is thrown back and receives most of the weight of the body, the knees are bent, the bayonet brought to a horizontal position level with the waist. This is the 'guard,' and according to the parry to be made the weapon is carried either to the 'high' position, pointing upwards from the breast, or to the 'low' position, pointing downwards from the breast. In taking the offensive the right leg is straightened, and the left bent forward, without moving the feet from their place. The butt of the rifle is pressed firmly to the shoulder and points straight forward. In 'shortening arms' the butt is carried back to the full extent of the right arm, while the barrel (turned downwards) rests upon the left arm. The body rests upon the right leg, which is slightly bent, while the left is somewhat advanced.

Fénelon (fān-lōn'). FRANÇOIS DE SALIGNAC DE LA MOTHE, one of the most venerable of the French clergy, born in 1651 at the Château Fénelon, in Périgord, of a family illustrious in church and state. A gentle disposition, united with great vivacity of mind and a feeble and delicate constitution, characterized his youth. He was educated under the eye of his uncle, the Marquis of Fénelon, and afterwards at St. Sulpice, Paris. He took orders at the age of twenty-four, and distinguished himself in the work of converting Protestants. In 1681 his uncle conferred on him the priory of Carennac. Soon after he wrote his first work, *Traité de l'Education des Filles*, which was the basis of his future reputation. In 1689 Louis XIV entrusted to him the education of his grandsons, the Dukes of Burgundy,

Anjou, and Berri. In 1694 he was created Archbishop of Cambray. A theological dispute (see *Quietism*) with Bossuet, the virtual head of the French Church, terminated in his condemnation by Pope Innocent XII, and his banishment to his diocese by Louis XIV. Fénelon submitted without the least hesitation, and thenceforward lived contentedly in his diocese, sustaining the venerable character of a Christian philosopher, and scrupulously performing his sacred duties. He died in 1715. He left numerous works in philosophy, theology, and belles-lettres. The most celebrated is *Les Aventures de Télémaque*, in which he endeavored to exhibit a model for the education of a prince. It was commonly taken for a satire on the reign of Louis XIV, though nothing, probably, was further from the mind of Fénelon.

Fenians (fē'ni-anz), a name usually derived from Fionn or Finn, the name given to a semi-mythical class of Irish warriors famous for their prowess. The name has been assumed in recent years by those Irish who formed a brotherhood in their own country and in America, with the intention of delivering Ireland from the sovereignty of England, and establishing an Irish republic. About the end of 1861 the Fenian Brotherhood was organized in the United States; and its chief council, consisting of a 'head-center,' John O'Mahony, and five other members, which had its seat at New York, soon had branches in every state of the Union, while at the same time large numbers joined the cause in Ireland, where James Stephens was 'head-center.' The close of the American Civil war, when large numbers of trained Irish soldiers who had taken part in the war were released from service, was thought to be a convenient time for taking some decisive steps. Two risings were planned in Ireland, but they were both frustrated by the energetic measures of the British government, the first, in September, 1865, by the seizure of the office of the *Irish People*, the Fenian journal published at Dublin, in which papers were found which revealed to the government the secrets of the conspiracy, and which led to the capture of the ringleaders, Luby, O'Leary, O'Donovan Rossa, and others; the second, in February, 1866, was as speedily suppressed by the suspension of the Habeas Corpus Act in Ireland. An invasion of Canada from New England, attempted in the same year, failed as miserably as the attempt in Ireland, and convinced the Irish that they could not expect the aid from the American people on which they hitherto counted. At last, on March 5, 1867, the long-prepared insurrection broke out almost simultaneously in the districts of Dublin, Drogheda, and Kerry. The number of insurgents in the field, however, did not exceed 3000, and though they burned some police stations, they nowhere faced the troops sent after them. About the same time some forty or fifty Irish-Americans landed in a steamer near Waterford, but soon after fell into the hands of the police. In 1870 and 1871 two raids were again made on Canada, but both were ridiculous failures, the first being repulsed by the Canadian Volunteers, and the second suppressed by the United States government. A serious outbreak took place in Dublin in 1916, but was soon suppressed.

Fenne, George Manville, an English author, born at Pimlico in 1831; died in 1909. He became a successful sketch writer, following this up with a large number of boy's stories, some of them very successful. He also wrote numerous novels and Christmas stories, with several dramas and farces, being among the most voluminous of modern writers.

Fennec (fen'ek; *Canis zerda*), a small animal allied to the dog and fox, and sometimes called the Sahara fox, being a native of that region. It lives on birds, jerboas, lizards, dates, etc., burrows with great facility, and is easily tamed. It is fox-like in appearance, and is remarkable for the great size of its ears.

Fennel (fen'el), a fragrant plant, *Fœniculum vulgare*, cultivated in gardens, belonging to the nat. order Umbelliferæ. It bears umbels of small yellow flowers, and has finely-divided leaves. The fruit, or in common language the seeds, are carminative, and frequently employed in medicine.—*Giant fennel* is a popular name for *Ferula communis*, which attains sometimes a height of 15 ft.

Fenugreek (fēn'ū-grēk), a leguminous plant, *Trigonella Fœnum græcum*, whose bitter and mucilaginous seeds are used in veterinary practice. It is an erect annual, about 2 ft. high, a native of the south of Europe and of some parts of Asia.

Feodor (fā'o-dor), the name of three Russian princes—Feodor I, son of Ivan the Terrible, reigned from 1584-98. He was a feeble prince, who allowed himself to be entirely governed by his brother-in-law, Boris Godunov. With him the Russian dynasty of Rurik became extinct.—Feodor II, son of

Boris Godunov, reigned only for a short time in 1605.—Feodor III, the son of Czar Alexis, reigned from 1676-82, warred with the Poles and Turks, and, by the peace of Baktschisarai, obtained possession of Kiev and some other towns of the Ukraine.

Feodosia (fe-a-dō'sē-ya; formerly Kaffa), a town in Russia, in the southeast of the Crimea. From 1266 to 1474 this town was in possession of the Genoese, in whose hands it became the seat of an extensive commerce with the East, and is said to have had a population of 80,000. It is still one of the most important towns in the Crimea. Pop. 27,238.

Feoffment (fef'ment), in law, that mode of conveying property in land where the land passes by livery in deed, that is, actual delivery of a portion of the land, as a twig or a turf; or when the parties, being on the land, the feoffer expressly gives it to the feoffee. As the statute of uses has introduced a more convenient mode of conveyance, feoffments are now rarely used except by corporations. See *Seisin, Seisin.*

Feræ naturæ (fē'rē na'tu-rē; 'of a wild nature'), the name given in the Roman law to beasts and birds that live in a wild state, as distinguished from those which are *domitæ naturæ*, that is, tame animals, such as horses, sheep, etc. The right of property in such animals exists only as long as they are in a state of confinement or within the boundaries of the possessor's lands, unless it can be proved that any special animal had been trained to return to its master's property.

Fer-de-lance (fêr-de-lăns), the lance-headed viper or *Craspedocephălus* (*Bothrops*) *lanceolātus*, a serpent common in Brazil and some of the West Indian Islands, and one of the most terrible members of the rattlesnake family (Crotalidæ). It is 5 to 7 ft. in length. The tail ends in a horny spine which scrapes harshly against rough objects but does not rattle. Its bite is almost certainly fatal.

Ferdinand (fêr'di-nand), German emperors:—1. Ferdinand I, brother of Charles V, and born at Alcala, in Spain, 10th March, 1503. In 1522 he received the Austrian lands of the house of Hapsburg from the emperor, to which were afterwards added the kingdoms of Hungary and Bohemia in right of his wife Anna of Hungary. On the abdication of Charles he succeeded to the imperial title. He died in 1564.—2. Ferdinand II was born in 1578, and succeeded his uncle Matthias as Emperor of Germany in 1619. He was of a dark and reserved character, and had been brought up by his mother and the Jesuits in fierce hate of Protestantism. The result was a quarrel with his Bohemian subjects, who openly revolted and offered the Bohemian crown to the Elector Palatine, a step which led to the outbreak of the Thirty Years' war (1619). (See article under that head.) With the help of the Catholic League and John George, Elector of Saxony, he was placed firmly on the throne of Bohemia, where he relentlessly persecuted the Protestants. He died in 1637.—3. Ferdinand III, son of the preceding, was born in 1608, and succeeded his father in 1637. He had served in the Thirty Years' war and had seen the miseries which it occasioned and was reluctant to continue it. There were eleven years more of it, however, before the Peace of Westphalia was concluded in 1648. Ferdinand died in 1657.

Ferdinand V, King of Aragon, who received from the pope the title of *the Catholic*, on account of the expulsion of the Moors from Spain, was the son of King John II, and was born March 10, 1453. On the 18th of October, 1469, he married Isabella of Castile, and thus brought about that close connection between Aragon and Castile which became the basis of a united Spanish monarchy and raised Spain to pre-eminence amongst European states. After a bloody war of ten years they conquered Granada from the Moors (1491); but the most brilliant event of their reign was the discovery of America, which made them sovereigns of a new world. (See *Columbus.*) This politic prince laid the foundation of the Spanish ascendency in Europe by the acquisition of Naples (1503), and by the conquest of Navarre (1512); but his policy was deceitful and despotic. He instituted the court of the Inquisition at Seville in 1480, and, to the great injury of Spanish commerce, expelled the Jews (1492) and Moors (1501). He died in 1516.

Ferdinand I, of Bourbon, King of the Two Sicilies (previously Ferdinand IV of Naples), born January 12, 1751, was the third son of Charles III, King of Spain, whom he succeeded in 1759, on the throne of Naples, on the accession of the latter to that of Spain. In 1768 he married Maria Caroline Louisa, daughter of the Empress Maria Theresa, who soon acquired a decided influence over him. After the death of Louis XVI Ferdinand joined the coalition against France, and

took part in the general war from 1793 to 1796; but in 1799, after the defeat of the Neapolitans under Gen. Mack, the French took possession of the whole kingdom, and proclaimed the Parthenopean Republic. The new republic did not last long, and Ferdinand returned to power in 1800. Six years later he was again driven from Naples by the French. The Congress of Vienna finally re-established Ferdinand in all his rights as King of the Two Sicilies in 1814, while Naples was still occupied by Murat. But after the flight of the latter in March, 1815, Ferdinand once more entered Naples. In 1820, in consequence of a revolution, Ferdinand was obliged to swear to support a new and more liberal constitution, but with the help of Austria he soon set up a despotic monarchy. He died in 1825, and was succeeded by his son, Francis I.

Ferdinand II, grandson of the preceding and King of the two Sicilies, who succeeded his father, Francis I, in 1830, was born in 1810 and died in 1859. He was nicknamed Bomba, from the bombardment of his palace in 1849. He was succeeded by his son, Francis II.

Ferdinand, King of Roumania, was born in 1865 and succeeded to the throne of Roumania in 1914, following the death of his uncle, Charles I, a few months after the outbreak of the Great war. Although a Hohenzollern, his sympathies were with the Allies, and in 1916 he declared war on the Central Powers.

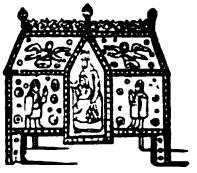
Ferdinand I, Czar of Bulgaria, was born in Vienna in 1861. Prince Ferdinand was elected by the Bulgarian parliament as the successor of Alexander of Battenburg in 1887 and assumed the title of Czar in 1908, when Bulgaria proclaimed her independence from Turkey. He was an active leader in the Balkan wars and in the European war, which Bulgaria entered on the side of Germany in 1915.

Ferdinand VII, King of Spain, eldest son of Charles IV, and of Maria Louisa of Parma, born in 1784; ascended the throne in March, 1808, when a popular rising forced his father to abdicate in his favor. A month later he himself abdicated in favor of Napoleon, who conferred the crown on his brother Joseph. Ferdinand returned to Spain in March, 1814. His arbitrary conduct caused an insurrection in 1820, which was at first successful, but Louis XVIII of France having sent an army to his aid, his authority was once more made absolute in Spain. Having no sons, he abolished the act of 1713 by which Philip V had excluded women from the throne of Spain, and then left his crown to his daughter Isabella to the exclusion of his brother, Don Carlos. It was during the reign of this king that the Spanish colonies in America broke away from the mother country.

Ferdinandea (fêr-di-nand'e-a). See *Graham Island.*

Fère (fâr), La, a town of N. E. France, department of Aisne, at the confluence of the Serre and the Oise, a fortress of the second rank. Pop. 3083.

Ferentino (fā-ren-tē'nō), a town in Central Italy, 6 miles northwest of Frosinone. It has remains of ancient walls, built of hewn stone without mortar. Pop. 12,270.



Feretory.

Feretory (fĕr'e tu-ri), a kind of box made of gold or other metal, or of wood variously adorned, and usually in the shape of a ridged chest, with a roof-like top, for containing the relics of saints. It is borne in processions.

Ferghana (fêr-gï'na), a province of Asiatic Russia in Turkestan, formed in 1876 out of the conquered khanate of Khokand. It consists mainly of a valley surrounded by high ranges of mountains and traversed by the Sir-Darya and its tributaries; area, 36,000 sq. miles. The climate is warm, and the soil in part fertile, but a considerable portion of the country is desert. Pop. 1906 est., 1,796,500. Khokand is the capital.

Fergus Falls, a city, capital of Otter Tail Co., Minnesota, on the Red River of the North. It has flour and woolen mills, ironworks, and other industries and a State hospital for the insane. Pop. 6887.

Ferguson (fêr'gū-son), Adam, a Scottish historical and political writer, born in 1724; died in 1816. In 1757 he succeeded David Hume as keeper of the Advocates' Library, Edinburgh, in 1759 was made professor of natural philosophy in the university, and in 1764 of moral philosophy. He resigned his chair in 1784. Among his chief works are an *Essay on Civil Society* (1767), *Institutes of Moral Philosophy* (1769), *History of the Roman Republic* (1783), etc.

Ferguson, James, an eminent experimental philosopher,

mechanist, and astronomer, was born of poor parents at Keith, in Banffshire, in 1710. While a boy tending sheep he acquired a knowledge of the stars, and constructed a celestial globe. With the help of friends he went to Edinburgh, where he studied mathematics and drawing, making such rapid progress in the latter that he was able to support himself by taking portraits in miniature. In 1743 he went to London, where he painted and gave lectures in experimental philosophy. Amongst his hearers was George III, then Prince of Wales, who afterwards settled on him a pension of £50 a year. He died in 1776. His principal works are: *Astronomy Explained upon Sir Isaac Newton's Principles* (1756); *Lectures on Mechanics, Hydrostatics*, etc. (1760), and *Select Mechanical Exercises* (1773).

Ferguson Bequest, a Scottish fund named from John Ferguson, a native of Irvine, who died in 1856, leaving about £500,000 for philanthropic purposes. Of this, £400,000 were set apart as a fund for aiding in the erection of churches and schools, supplementing the income of ministers, missionaries, and teachers of schools, and maintaining public libraries. Only *quoad sacra* Established Churches, Free, United Presbyterian, and Congregational Churches share in the benefits. The Ferguson Scholarships in classics, mathematics, and philosophy respectively, one in each subject annually open to competitors from all the Scotch universities, were also founded by him.

Fergusson (fèr'gus-on), JAMES, a writer on architecture, born at Ayr in 1808. He went out to India as partner of an important commercial house, but after some years retired from business to devote himself to the study of architecture and early civilizations. In 1845 he published *Illustrations of the Rock-cut Temples of India;* in 1849, *A Historical Enquiry into the True Principles of Beauty in Art;* in 1851, *The Palaces of Nineveh and Persepolis Restored;* in 1855, *Illustrated Handbook of Architecture;* in 1862, *History of the Modern Styles of Architecture*, a sequel to the handbook, both being afterwards combined in *History of Architecture in All Countries* (3 vols. 1865-67), and completed by a *History of Indian and Eastern Architecture* (1876). He also wrote on the site of the Holy Sepulchre at Jerusalem; *Tree and Serpent Worship; Rude Stone Monuments in All Countries*, etc. He died in 1886.

Fergusson, ROBERT, a Scottish poet of distinguished merit, was born at Edinburgh, October 17, 1750. He was educated at St. Andrews University, and became clerk to a writer of the signet in Edinburgh. He wrote poems, of which those in the Scottish dialect have genuine poetic excellence. Social excesses, into which he was led, impaired his feeble constitution, and brought on disease, which terminated his existence in 1774. He was buried in the Canongate Churchyard, Edinburgh, where Robert Burns erected a monument to the memory of his kindred genius, to whom he owed suggestions for several of his own poems.

Ferish'ta, more properly Mohammed Kasim, a Persian historian, born at Astrabad about 1550. He went to India with his father, and was for some time the tutor of a native prince. He wrote a history of the *Mohammedan Power in India*, which is the best yet written on the period which it embraces. He died about 1612.

Fermanagh (fer-mă'nâ), an inland county in Ireland, in the province of Ulster; area, 714 sq. miles. The county is divided lengthwise into two nearly equal portions by Lough Erne, and exhibits a succession of abrupt eminences of slight elevation, but is mountainous towards its western boundary. The soil is variable, and not remarkably fertile. The manufactures are unimportant. Politically it is divided into North Fermanagh and South Fermanagh, each sending one member to Parliament. Pop. 65,430.

Fermentation (fer-men-tā'shun), the spontaneous conversion of an organic substance into new compounds by the influence of a ferment, these ferments being apparently vegetable organisms of extremely simple type, which by their life, growth, and increase set up the changes. There are several kinds of fermentation: 1st, the *vinous* or *alcoholic* fermentation—the most important from an economic and industrial point of view—in which the sugar contained in liquids is converted into alcohol, carbonic acid, and glycerin; 2d, the *acid* fermentation, in which spirituous liquors become acid, producing acetic acid; 3d, the *putrid* fermentation, by which organic substances undergo various alterations according to the nature of the substance, and generally set free poisonous gases. Fermentation is also described as lactic, butyric, etc., according to the nature of the results. The general course of alcoholic fermentation, as seen in brewing and wine making, is as follows: After a lapse of time, which may vary much according to the temper-

wine intended for sacramental purposes. At 26 he took part in an insurrection and had to seek refuge in Paris. After fifteen years he returned to Spain and settled in Barcelona. He had been enriched by a legacy of about $200,000, and with the aid of this he equipped a press for the printing of works of anticlerical literature. He also became a teacher and one of extraordinary ability. He founded what he called the Modern School, in which the most liberal and anarchistic sentiments were taught. This led, on September 1, 1909, to his arrest on the charge of being an instigator of the revolutionary outbreak in Barcelona at that time. He was hastily and secretly tried, adjudged guilty, and executed on the 13th. This act was imputed to the hatred of the clergy, and excited indignation among the apostles of free thought throughout Europe and America.

Ferrero (fe-rā'rō), GUGLIELMO, an Italian historian and man of letters, born in 1872 at Portici, near Naples. He has lectured widely in Europe and America, and his works are well known, especially his *Greatness and Decline of Rome*. This throws new light on Roman history and points out striking analogies between Roman and modern conditions. Other works are *Symbols* and *The Female Offender* (in collaboration with Lombroso).

Ferret (fer'et; *Putorius* or *Mustēla furo*), a carnivorous animal closely allied to the polecat, about 14 inches in length, of a pale-yellow color;

Ferret (*Mustēla furo*).

with red eyes. It is a native of Africa, but has been introduced into Europe and America. It cannot bear cold or subsist, even in France, except in a domestic state. Ferrets are used, in catching rabbits, to drive them out of their holes, and to drive away rats in the same manner.

Ferrier (fer'i-ėr), DAVID, a Scotch physician, born at Aberdeen in 1843, and became a professor in King's College, London, in 1873. His researches in the brain and success in localizing its functions attracted great attention, and our knowledge of the conditions of brain disease, epilepsy, etc., are largely due to his labors. His discoveries are told in *The Functions of the Brain* (1876), and *The Localization of Cerebral Disease* (1879).

Ferrier, JAMES FREDERICK, a Scotch metaphysician, born at Edinburgh in 1808; died at St. Andrews in 1864. After studying at Edinburgh and Oxford he was admitted to the Scottish bar in 1832, but gave his attention more to literature than to law. His contributions to *Blackwood's Magazine*, then at the height of its fame, brought him into notice, and in 1845 he was appointed to the chair of moral philosophy at St. Andrews. His chief work is the *Institutes of Metaphysic*, in which he attempts to build up in a rigorously logical and deductive method a complete system of knowing and being.

Ferris Wheel, THE, exhibited at the Chicago World's Fair, was a remarkable engineering feature. Its diameter was 270 ft.; its circumference 825 ft. Its highest point was 280 ft. The axle was a steel bar, 45 ft. long, 32 inches thick. Fastened to each of the twin wheels was a steel hub 16 ft. in diameter. The 36 cars on the wheel each comfortably seated 40 persons, wheel and passengers weighing 1200 tons. The two towers at the axis supporting the wheel were 140 ft. high. The motive power was a 1000 horsepower steam engine under the wheel. By the Ferris wheel the almost indefinite application of the tension spoke to wheels of large dimensions has been vindicated, the expense being far smaller than that of the stiff spoke. It has been imitated at later exhibitions. Its builder, George W. Ferris, an able engineer, was born at Galesburg, Illinois, in 1854; died in 1896.

Ferro (fėr'rō), or HIERRO, the most southwestern and smallest of the Canary Islands, about 18 miles long and 9 miles broad. This island having once been supposed the most western point of the Old World, was formerly employed by all geographers to fix their first meridian, and the longitude reckoned from it. As first meridian its conventional place is 20° w. of Paris and 17° 40′ w. of Greenwich. It is still occasionally used by German geographers.

Ferrocyanic Acid. See *Prussic Acid.*

Ferrol (fėr-rōl'), a fortified seaport of Northern Spain, in the province and about 12 miles N. E. of the town of Coruña, on a fine inland bay,

connected with the sea by a channel so narrow as to admit only one ship-of-the-line at a time. The chief naval arsenal of Spain, established on a magnificent scale, is here. The manufactures consist chiefly of swords, cutlery, and military and naval equipments. Pop. 25,281.

Ferry (fĕr'i), a particular part of a river, lake, arm of the sea, etc., where a boat or other conveyance plies to carry passengers or goods from the one side to the other. The right of establishing a public ferry is usually the prerogative of a government or legislature. The person who has a right of ferry is required to keep a boat or boats suitable for the conveyance of passengers, to charge a reasonable fare, and to provide the requisite landing-places on either bank of the river. No one will be allowed to establish a rival ferry so near the original one as to destroy its custom. Common rowing-boats, sailing-boats, large flat-bottomed barges pulled along a rope stretched from bank to bank for horses and carriages, and steam ferry-boats are among the conveyances.

Ferry (fā-rē), Jules François Camille, a French statesman and writer, bòrn at St. Dié in the Vosges in 1832. He became a barrister at Paris, but devoted himself almost entirely to journalism. His articles in the *Presse*, *Courrier de Paris*, and *Temps*, from 1856 to 1869, brought him much into notice, and in 1869 he was returned as deputy for the sixth arrondissement of Paris and took his seat among the members of the 'Left.' After the fall of Sedan he became a member of the Government of the National Defense. In 1872 Thiers appointed him minister-resident at Athens. In 1879 he became minister of public instruction, and as such introduced an education bill, which amongst other things forbade unauthorized communities, such as Jesuits, to teach in schools. In 1880, Ferry, having become premier, entered upon a vigorous and somewhat hazardous foreign policy. His seizure of Tunis in 1881 was in itself successful, though it led to his resignation; again premier in 1883 his unfortunate expedition to Tonquin forced him to retire from office. On Feb. 24, 1893, he was elected president of the senate, but died March 17 of the same year.

Ferry, Thomas White, Senator, was born at Mackinaw, Michigan, in 1827; died in 1896. He was elected to the Michigan legislature in 1850, served in the House of Representatives at Washington 1864-71, and in the Senate 1871-83. As president *pro tem.* of the Senate, he became acting Vice-President of the United States on the death of Vice-President Wilson in 1875.

Ferté-sous-Jouarre (fer-tā-sŏ-zhö-ār), a town of France, department of Seine-et-Marne, 37 miles E. N. E. of Paris. Pop. 4804.

Fertilization of Plants.

See *Botany.*

Fertilizers (fer-til-i'zerz), the name given to various kinds of manures for enriching soils, (which see).

Ferula (fer'u-la), a genus of umbelliferous plants, whose species often yield a powerful stimulating gum resin, employed in medicine. The species are natives of the shores of the Mediterranean and Persia, and are characterized by tall-growing, pithy stems, and deeply-divided leaves, the segments of which are frequently linear. *F. communis* of English gardens is called giant fennel. *F. orientalis* and *F. tingitana* are said to yield African ammoniacum, a gum resin like asafetida, but less powerful. *Ferula fœtida* (or *F. persica*) produces asafœtida.

Fescennine Verses (fes'sen-in), rude Latin verses in the form of a dialogue between two persons, who satirized and ridiculed each other's failings and vices with great freedom of speech. They originated in country districts in ancient Italy, but were ultimately introduced into the towns, and formed a favorite amusement at marriages and on other occasions of festivity.

Fescue (fes'kū), the popular name of a genus of grasses (*Festūca*) belong to the division with many-flowered spikelets on long stalks. *F. pratensis*, or meadow fescue, and *F. duriuscŭla*, or hard fescue, are both highly prized for agricultural purposes. *F. ovina*, or sheep's fescue, is much smaller than either of these, and is useful for lawns. It is abundant in mountain pastures. *F. elatior*, the tall fescue, is a coarse reedy grass with stem usually 4 or 5 feet high. All these species are perennial.

Fesse.

Fesse (fes), in heraldry, a band or girdle comprising the central third part of the shield, and formed by two horizontal lines drawn across it; it is one of the nine honorable ordinaries. The fesse-point is the exact center of the escutcheon.

Fessenden, WILLIAM PITT, an American statesman and financier, born at Boscawen, N. H., in 1806; died in 1869. His anti-slavery views secured his election to the Senate in 1854, and his speeches brought him fame. When the war broke out he became head of the Finance Committee, and in 1864 became secretary of the treasury. He returned to the Senate in 1865, becoming the recognized leader of the Republican party, but brought on himself undeserved unpopularity by opposing the impeachment of President Johnson (1868).

Festiniog (fes-tin'i-og), a town of N. Wales in Merioneth, with important slate quarries. Pop. 9682.

Festivals (fes'ti-valz), or FEASTS, certain days or longer periods consecrated to particular celebrations either in honor of some god, or in commemoration of some important event. Such festivals have prevailed among nearly all nations, both ancient and modern. Among the Jews there are six festivals prescribed in the Scriptures (Lev., xxiii), and thence called sacred feasts. These are the weekly feast of the Sabbath; the Passover, or Feast of Unleavened Bread; Pentecost, or the Feast of Weeks; the Feast of Trumpets, or New Moon; the Feast of the Atonement; and the Feast of Tabernacles. Afterwards the Feast of Purim (to commemorate the failure of Haman's machinations) and the Dedication of the Temple (after its profanation by Antiochus Epiphanes) were added. Among the ancient Greeks were celebrated the Dionysia; the Eleusiania; the four great national games, the Olympic, the Isthmian, Nemean, and Pythian games. But each community and city had its own local festivals in addition, such as the Panathenæa, held by the tribes of Attica, whose union it was intended to celebrate. Among Roman festivals were the Saturnalia, Cerealia, Lupercalia, and others.

The festivals of the Christian Church owe their origin partly to those of the Jewish religion, such as Easter, which corresponds to the Passover of the Jews, and Whitsuntide, which corresponds to Pentecost; partly also to pagan festivals, which the Christian hierarchy, finding it impossible to abolish them, applied to Christian uses by converting them into festivals of the church. These festivals are divided into movable and immovable; the former those which in different years fall on different days, the latter those which always fall upon the same day. The chief of the movable feasts is Easter, the one on which the position of all the others, except that of Advent Sunday, depends. (See *Easter*.) Septuagesima Sunday falls nine weeks before Easter, Sexagesima Sunday eight weeks, Quinquagesima Sunday seven weeks, the first Sunday in Lent six weeks, and Palm Sunday one week before Easter. Rogation Sunday falls five weeks, Ascension Day forty days, Whitsunday seven weeks, and Trinity Sunday eight weeks after Easter. Ash Wednesday is the Wednesday before the first Sunday in Lent, Maundy Thursday the Thursday, and Good Friday the Friday before Easter, and Corpus Christi is the Thursday after Trinity Sunday. Advent Sunday is the nearest Sunday to the feast of St. Andrew, November 30, whether before or after. The chief immovable feasts are the feast of the Circumcision on the 1st of January, Epiphany on the 6th of January, the Annunciation of the Blessed Virgin on the 25th of March, the Transfiguration of Christ on the 6th of August; the feast of St. Michael (Michaelmas) and All the Angels on the 29th of September, the feast of All Saints on the 1st of November, the festival of All Souls on the 2d of November, and Christmas Day, or the Feast of the Nativity of our Lord, on the 25th of December. The festivals relating to the Virgin Mary in the Roman Catholic Church include: the feast of the Annunciation; the Purification of the Virgin, or Candlemas; the feast of the Visitation of Our Lady; the feast of the Immaculate Conception; the Nativity of the Virgin; the Martyrdom of the Virgin Mary; the Assumption of the Virgin (Aug. 15); and several smaller ones. The worship of the cross introduced two festivals: that of the Invention of the Holy Cross (May 3), and that of

the Exaltation of the Cross (September 14). The saints' days that are still held as festivals, and have religious services connected with them in the Church of England, are called *red-letter* days, because they used to be printed with red letters in the church calendar; while the saints' days which were still retained in the calendar at the Reformation, but had no services connected with them, are called *black-letter* days, because they were printed in black letters.

Festoon (fes-tön'), in architecture, same as *Encarpus*.

Festus (fes'tus), PORCIUS, a Roman procurator of Judea 61-62 A.D., successor of Felix. The Apostle Paul appeared before him, and was sent by him to Rome at his own request.

Festus, SEXTUS POMPEIUS, a Roman grammarian belonging to the second or third century of our era, author of an abridgment of a work by Verrius Flaccus called *De Verborum Significatione*, a kind of dictionary, which is very valuable for the information it contains about the Latin language. The work of Festus was still further abridged in the eighth century by Paulus Diaconus. The one MS. of the original work of Festus is now at Naples.

Fétis (fā-tēs), FRANÇOIS JOSEPH, a Belgian musical composer and writer on music, born 1784; died 1871. He was educated at the Paris Conservatoire; was professor there from 1818 to 1833, when he was appointed director of the Conservatoire at Brussels. Among his works may be mentioned *Traité de la Fugue* (1825); *Biographie Universelle des Musiciens* (1835-44); and *Traité Complet de la Théorie et de la Pratique de l'Harmonie*. His musical compositions include operas, sacred music, and instrumental pieces for the piano and the violin.

Fetish, or FETICH (fē'tish), a word first brought into use by De Brosses, in his work *Du Culte des Dieux Fétiches* (1760), and derived from the Portuguese *feitiço*, magic, a word which expressed the Portuguese opinion of the religion of the natives of the west coast of Africa. The Portuguese gave this name to the idols of the negroes of Senegal, and afterwards the word received a more extensive meaning. A fetish is any object which is regarded with a feeling of awe, as having mysterious powers residing in it, but without any consciousness in the exercise of them. The fetish may be animate, as a cock, a serpent, etc.; or inanimate, as a river, a tooth, a shell. Fetish worship prevails in Guinea and other parts of the west coast of Africa. In addition to the common fetish of the tribe every individual may have one of his own. To this he offers up prayers, and if they are not heard he punishes it, or perhaps throws it away, or breaks it in pieces.

Fetus, FŒTUS (fē'tus), the young of viviparous animals in the womb, and of oviparous animals in the egg, after it is perfectly formed; before which time it is called *embryo*.

Feu (fū), FEU-HOLDING, in Scottish law, in its widest sense signifies any tenure of land which constitutes a relation of superior and vassal. The term is now, however, restricted to a special kind of tenure by which usually a small piece of ground is held perpetually from a superior on payment of an annual sum.

Feudal System (fū'dal), that system by which land (a *fief*) is held by a vassal on condition of fidelity—that is, in consideration of services to be rendered to his superior or feudal lord. The nature of the feudal system is to be explained by its origin among the Germanic tribes. In the earliest times the relation of superior and vassal did not exist in connection with the ownership of land. Each freeman had his share of the tribe lands, which were held simply on condition of his fulfilling his public duties of attendance at the councils of the mark or township and performing his share of military service in the wars or musters decreed at such councils. The noble had, of course, more land and more influence than the simple freeman, but there need be no tie of vassalage between them. This seems to have been the primitive social organization of the Anglo-Saxons and other German tribes. The lands held by all freemen, whether noble or ordinary freemen, under this system, are said to be *allodial*, as distinguished from *feudal* lands, which imply service to a superior lord. By the close of the tenth century, however, this system had undergone considerable modifications. The masses of Teutonic invaders who overran Gaul and England had necessarily to confer exceptional powers on their leaders; and as they were for long very much in the position of military in an enemy's country, these powers were naturally continued. Thus it was that kings, before unknown to the Anglo-Saxons, make their appearance immediately after their descent upon Britain. It was common for a chief or great man to have a retinue or bodyguard composed of valiant youths, who were furnished by the chief with arms and provisions, and who in return devoted themselves to his service. These com-

panions (Anglo-Saxon, *Geslthas;* German, *Gesellen*) originally received no pay except their arms, horses, and provisions, and the portion of the spoils which remained after the chieftain had taken his own share. But when conquered lands came to be apportioned and large districts fell into the hands of kings or dukes and their subordinates, they gave certain portions of the territory to their attendants to enjoy for life. These estates were called *beneficia* or fiefs, because they were only lent to their possessors, to revert after their death to the grantor, who immediately gave them to another of his servants on the same terms. As the son commonly esteemed it his duty, or was forced by necessity, to devote his arm to the lord in whose service his father had lived, he also received his father's fief; or rather, he was invested with it anew. By the usage of centuries this custom became a right and the fief became hereditary. A fief rendered vacant by the death of the holder was at once taken possession of by his son, on the sole condition of paying homage to the feudal superior. Thus a feudal nobility and a feudal system arose and for a time existed alongside of the old allodial system. But gradually the greater security to be got by putting oneself under the protection of some powerful ruler or leader gave the feudal system the predominance. The free proprietor of landed property, oppressed by powerful neighbors, sought refuge in submitting to some more powerful nobleman, to whom he surrendered his land, receiving it back as a vassal. Even the inferior nobility found it to be to their advantage to have themselves recognized as feudatories of the nearest duke or earl; and as the royal power steadily advanced, the offices of duke, ealdorman, gerefa, etc., were always bestowed by the king. Thus the crown became the source of all authority and possession in the country. The land which had once been 'folcland,' or the land of the people, became the land of the king, from whom all titles to it were held to be derived. Such at least was the development of feudalism in England, where its centralizing tendencies, especially in the matter of holding land from the crown, were strongly reinforced by the circumstances of the conquest under William the Norman. Under him and his immediate successors there was a struggle between royalty and the nobility, which ended in the power of the latter sinking before that of the kings. On the other hand, in Germany, France, and elsewhere on the continent, the disintegrating tendencies of feudalism as a system of government had full play. In these countries the weakening of the kingly authority encouraged the great feudal dukes and counts to set up in an almost absolute independence, which in France was afterwards gradually lost as the monarchy grew stronger, but in Germany continued to divide the land down almost to our own times into a number of petty principalities.

Among the chief agencies that overthrew the feudal system were the rise of cities, the change in modes of warfare, and the spread of knowledge and civilization. The spirit of the feudal system, grounded on the prevalence of landed property, was necessarily foreign to cities which owed their origin to industry and personal property, and founded thereon a new sort of power. The growth of this new class, with its wealth and industrial importance, has contributed more than anything else to a social and political development before which the old feudal relations of society have almost totally disappeared. Even yet, however, the laws relating to land still bear the stamp of feudalism in various countries. In England, for instance, all landowners are theoretically regarded as tenants holding from some superior or lord, though the lord may be quite unknown. See also *Middle Ages.*

Feuerbach (foi'ĕr-bȧh), LUDWIG ANDREAS, a German metaphysician, son of the celebrated jurist (see next article), was born at Landshut in Bavaria in 1804. After studying theology and philosophy at Heidelberg and Berlin he became a tutor (privatdocent) at Erlangen University in 1828. As his negative views in theology were obnoxious to government, and thus deprived him of all chance of a professorship, he resigned, and the latter part of his life was passed in straitened circumstances. He died in 1872. All transcendental ideas, such as God, immortality, etc., Feuerbach came to regard as deleterious illusions, and considered that the direct contact of the senses with things alone gave the full truth. His works include a *Critique of Hegel* (1839); *The Essence of Christianity* (1841), translated by George Eliot (1854); *The Essence of Religion* (1849), and *Godhead, Freedom, and Immortality* (1866).

Feuerbach, PAUL JOHANN ANSELM, a German criminal jurist, was born at Jena in 1775. Having published his first work, entitled *Anti-Hobbes*, in 1798, he began in 1799 to deliver lectures on law at Jena as privatdocent. In 1801 he became an ordinary professor of jurisprudence at

Jena, but the following year accepted a chair at Kiel. In 1804 he obtained an appointment in the University of Landshut, where he was employed to draw up the plan of a criminal code for Bavaria, which received the royal assent in 1813. In 1814 he was appointed second president of the appeal court at Bamberg, and in 1817 first president of the appeal court for the circle of Rezat at Anspach. He died in 1833. Among his most interesting and important works are *Remarkable Criminal Trials*, and *Themis, or Contributions to the Art of Lawmaking.*

Feuillants (*feu*-yän), a religious order which arose as a reform of the order of Bernardins, and took origin in the abbey of Feuillants, near Toulouse, established in 1577. There were also convents of nuns who followed the same reform, called *Feuillantines.* They were suppressed by the revolution of 1789, and their convent in Paris taken possession of by a political club named the Feuillants, of which Mirabeau was a member.

Feuillet (*feu*-yā), OCTAVE, a French novelist and dramatist, born at Saint Lô, department of Manché, in 1812, came into notice about 1846 with his novels of *Le Fruit Défendu, Le Conte de Polichinelle*, and a series of comedies and tales which were published in the *Revue des deux Mondes.* In 1857 the appearance of *Le Roman d'un Jeune Homme Pauvre* raised Feuillet to the first rank of the novelists of the day. Amongst his other numerous novels are *Monsieur de Camors* (1867), *Julia de Trécœur* (1872), *Le Sphinx* (1874), *Histoire d'une Parisienne* (1881), etc. His works have a refined humor, and are free, in great part, from the realistic coarseness of the later French school. Died 1890.

Feuilleton (*feu*-i-ton), that part of a French newspaper devoted to light literature or criticism, and generally marked off from the rest of the page by a line. The feuilleton very commonly contains a tale.

Fever (fē'ver; Latin, *febris*), a diseased condition of the body characterized by an accelerated pulse, with increase of heat, deranged functions, diminished strength, and often with excessive thirst. Fevers usually commence with chills or rigors, known as the *cold stage* of the disease, although the temperature of the body is really increased. There are also a feeling of lassitude, pains in the back and limbs, loss of appetite, and nausea. This soon develops into the *hot stage*, in which the pulse quickens and the skin becomes hot and dry. These phenomena are accompanied by thirst, headache, a furred tongue, a constipated state of the bowels, and a deficiency in the urinary secretion. The symptoms are generally aggravated at night, and may even be accompanied by slight delirium. After a time the *crisis* is reached, when the patient either dies from gradual exhaustion or from hyperpyrexia, or he begins to recover, the febrile symptoms disappearing sometimes quite suddenly, sometimes very slowly. The loss of strength in fever due to the waste of tissue (caused by the abnormal temperature) being greatly in excess of the nutritive supply, together with the general disturbances of functions, often brings about fatal results. In many cases fever is only an accompanying symptom of some specific disorder, but in others it is the primary and predominant element, apparently due to some poison operating in the blood. (See *Germ Theory of Disease.*) These primary or specific fevers may be classified as follows:—

1. *Continued Fever*, in which there is no intermission of the febrile symptoms till the crisis is reached. Simple fever, or febricula, typhus, typhoid (enteric or gastric) fever are examples. *Relapsing fever* also comes under this head; its chief feature is the recurrence of fever about a week after the subsidence of the symptoms.

2. *Intermittent Fever* or *Ague*, in which there is a periodic cessation of the symptoms. The varieties are the *quotidian*, occurring every day; the *tertian*, recurring in 48 hours; *quartan*, recurring in 72 hours or every three days.

3. *Remittent Fever*, in which there is a short daily diminution of the symptoms. The condition known as hectic fever and yellow fever belong to this class.

4. *Eruptive Fevers* — (1) Smallpox. (2) Cowpox. (3) Chicken-pox. (4) Measles. (5) Scarlet fever. (6) Erysipelas. (7) Plague. (8) Dengue fever. See the separate articles.

Feverfew (fē'ver-fū; *Pyrethrum Parthenium* or *Matricaria Parthenium*), a common composite biennial, frequent in waste places and near hedges. It has a tapering root, an erect, branching stem about 2 feet high, and stalked compound leaves of a hoary green color, and ovate cut leaflets. The plant possesses tonic and bitter qualities, and was supposed to be a valuable febrifuge, whence its name.

Fez, one of the two capitals of Morocco, 100 miles east of the Atlantic and 85 miles south of the Mediterranean. It is finely situated on the

hilly slopes of a valley, on the river Fez, which divides Old Fez from New Fez. Both parts are surrounded by walls now in very bad repair. The streets are narrow, dark, and extremely dirty; the houses two or three stories high, and without windows to the street. The interiors, however, are often handsome, the courtyards being paved and provided with fountains. There are many mosques, one of them the largest in N. Africa. The sultan's palace is a large but somewhat ruinous structure. Fez is a place of considerable commercial importance, being the depot for the caravan trade from the south and east and having extensive dealings with Europe. The manufactures consist of woolen cloaks, silk handkerchiefs, leather, the red caps named *fezes*, carpets, pottery, etc. Fez was at one time famous as a seat of Arabian learning. It is considered a holy town by the Western Arabs, and was resorted to by them as a place of pilgrimage when the way to Mecca was obstructed. Fez was founded in 793, and was the capital of an independent state from 1202 to 1548, attaining a high state of prosperity. The population is variously estimated from 90,000 to 140,000, with about 10,000 Jews.

Fez (from *Fez*, the above town), a red cap of fine cloth, with a tassel of blue silk or wool at the crown, much worn in Turkey, on the shores of the Levant, in Egypt, and North Africa generally. The core or central part of a turban usually consists of a fez.

Fezzan (fez-zän'), a state of North Africa, in the Sahara, forming a depression surrounded by mountain chains and consisting of a great number of small oases. There are no rivers or brooks, and few natural springs; but water is found in abundance at various depths, generally from 10 to 20 feet. Rain seldom falls; in some districts it does not rain for years together, and but little at a time. Wheat, barley, millet, figs, melons, and other fruits, tobacco, cotton, etc., are cultivated, but the chief wealth of the country is in its date-palms. With the exception of goats and camels, and in some districts sheep and cattle, few domestic animals are reared. There are few manufactures, but there is a considerable caravan trade, especially in slaves, Mourzuk, the capital, being the point of junction for caravans from Timbuctoo, Cairo, Tripoli, Soudan, etc. The natives are a mixed race of Arabs, Berbers, negroes, etc. Fezzan is governed by a lieutenant-governor (Kaïmakam) sent from, and dependent therefore on, Turkey. The population is variously estimated at from 50,000 to 150,000. Area, 120,000 square miles.

Fiacre (fē-ä-kr), in France, a small four-wheeled carriage or hackney-coach, so called from the Hotel St. *Fiacre*, where Sauvage, the inventor of these carriages, established in 1640 an office for the hire of them.

Fiat (fī'at); (Lat., 'let it be done'), in English law, a short order or warrant from a judge for making out and allowing certain processes.

Fiat Money, any currency, paper or metal, placed in circulation and maintained as legal tender by the command (fiat) of a government or other competent power. The term is usually applied to a paper currency, the substance of which is valueless, but which has been made legal tender by them, as distinguished from metal coins supposedly equal to their face value.

Fibers used in Manufacture.

These may be of mineral, animal, or vegetable origin. In the mineral kingdom a fiber which may be so used has been found in asbestos (which see). Amongst animal fibers the silk obtained from the cocoons of the silkworm and the wool of the sheep represent two great classes. (See *Silk* and *Wool*.) Of the latter, the wool of the sheep is by far the most important on account of its length, its fineness, and the comparative ease with which it can be produced in large quantities for the market. Amongst other animals whose wool or hair is also used to some extent are the goat, especially of the Angora species, the llama or alpaca, the vicuña, the rabbit, the yak, the chinchilla, etc. But the vegetable kingdom furnishes by far the greatest number and variety of fibers for manufacturing purposes. These fibers are obtained either, as in exogenous plants, from the sheath of the bark, or bast; or, as in endogenous plants, from the cellular tissues and pulp of their roots, stems, and leaves; or, in a few plants, from a hairy covering which grows upon the seeds within the pod. Of the first class are flax, from the fibers of the *Linum usitatissimum;* hemp, from the *Cannăbis sativa*, a plant of the nettle family; jute, from several species of *Corchŏrus*, a plant of the linden family; China grass from the *Boehmeria nivea*, etc. To the second class belong New Zealand flax, from the leaves of the *Phormium tenax;* Manila hemp, from the leafstalks of the *Musa textilis;* coir of cocoanut fiber, from the husk of the cocoanut; pita-flax, the fiber of the leaves of the *Agăve Americana*, etc. To the third class belong cotton, from the

seed-hairs of *Gossypium;* vegetable silk, the fibers which grow upon the seeds of the Asclepiadaceæ, etc. For details see *Cotton, Flax, Hemp, Jute, Silk, Wool,* etc.

Fibrin (fī'brin), a peculiar organic compound substance found in animals and vegetables. Animal fibrin constitutes the solid matter which deposits when blood coagulates, but it is also furnished by the chyle, lymph, saliva, and by pus and other pathological fluids. Fibrin is composed of carbon, nitrogen, hydrogen, and oxygen, and is closely allied to albumen and asein. It is a very important element of nutrition. In healthy venous blood there is about 2.3 present, but its percentage is slightly more in arterial blood. It is best obtained by switching newly-drawn blood with a glass rod or bundle of twigs, when the fibrin adheres to the rod or twigs in threads, and is purified from coloring matter by prolonged washing and kneading with water, and then by treatment with alcohol and ether to remove fat and other substances.

Fibrous Tissue (fī'brus), an animal tissue with a shining, silvery luster used to connect or support other parts. It is of two kinds, white, and yellow (elastic). It forms the ligaments, tendons of muscles, etc.

Fibula (fib'ū-la), in anatomy, the outer and smaller bone of the leg below the knee, much smaller than the tibia. See *Leg.*

Fichte (fih'tē), JOHANN GOTTLIEB, a German philosopher, born of poor parents in 1762; died in 1814. After studying at Jena, Leipzig, and Wittenberg he passed several years as a private tutor in Switzerland and in Prussia proper, and in Königsberg made the acquaintance of the great Kant, who showed some appreciation of his talents. His *Versuch einer Kritik aller Offenbarung* ('Essay Towards a Criticism of All Revelation,' 1792) attracted general attention, and procured him the professorship of philosophy in Jena in 1793. In 1800 he was one of the most prominent professors of that university during its most brilliant period. Here he published, under the name of *Wissenschaftslehre* ('Theory of Science'), a philosophical system, which, though founded on Kant's system, gives the latter a highly idealistic development which was strongly repudiated by the Königsberg philosopher. On account of an article he had written to the *Philosophical Journal* (on the grounds of our belief in the divine government of the world) he fell under the suspicion of atheistical views. This gave rise to an inquiry, which ended in Fichte losing his chair. He then went to Prussia, where he was appointed in 1805 professor of philosophy at Erlangen. During the war between Prussia and France he went to Königsberg, where he delivered lectures for a short time, returned to Berlin after the Peace of Tilsit, and in 1810, on the establishment of the university in that city, was appointed rector and professor of philosophy. Fichte's philosophy, though there are two distinct periods to be distinguished in it, is a consistent idealism, representing all that the individual perceives as distinct from himself, the *ego,* as a creation of this *I* or *ego.* This *ego,* however, is not the consciousness of the individual so much as the divine or universal consciousness of which the other is but a part. His philosophy thus came to assume a strongly moral and religious character. Amongst his best-known works, besides those already mentioned are: *System der Sittenlehre* ('Systematic Ethics'), *Die Bestimmung des Menschen* ('The Destination of Man'), *Das Wesen des Gelehrten* ('The Nature of the Scholar'), *Grundzüge des Gegenwärtigen Zeitalters* ('Characteristics of the Present Age'), *Reden an die Deutsche Nation* ('Addresses to the German Nation').

Fichtelgebirge (fi*h*-tĕl-ga-bēr'ga), a mountain range of Germany, in Bavaria; chief summit Schneeberg, 3460 feet.

Ficino (fē-chē'nō), MARSILIO, an Italian philosopher of the Platonic school, born at Florence in 1433. His early display of talent attracted the notice of Cosmo de' Medici, who caused him to be instructed in the ancient languages and philosophy, and employed him to aid in establishing a Platonic Academy at Florence (about 1460). Ficino amply satisfied his patron, and many excellent scholars were formed under his tuition. His exposition of Plato's philosophy suffers from his confounding the doctrines of Plato and those of neoplatonism. He died in 1499.

Fiction (fik'shun). See *Novel* and *Romance.*

Fiction, in law, is an assumption made for the purposes of justice, though the same fact could not be proved, and may be literally untrue. Thus an heir is held to be the same person as the ancestor to the effect of making the heir liable for the debts of the ancestor. The rules by which the existence of legal fictions are limited have been stated as follows: (1) The fiction must have the semblance of truth. (2) It shall not be used to work a wrong.

(3) It shall only be employed for the end for which it was introduced.

Fiddlewood, the common name of *Citharoxylon*, a genus of trees or shrubs with some twenty species, natives of tropical America, nat. order Verbenaceæ. Some of the species are ornamental timber trees; several yield a hard wood valuable for carpenter work.

Field (fēld), in heraldry, the whole surface of the shield on which the charges are depicted, or of each separate coat when the shield contains quarterings.

Field, CYRUS WEST, a telegraphic promotor, born at Stockwell, Mass., in 1819; died in 1892. Having become wealthy by trade in New York, he became interested in the idea of ocean telegraphy, and obtaining a charter giving him exclusive right for fifty years of landing ocean telegraphs on the coast of Newfoundland, he organized an Atlantic telegraph company. Attempts to lay cables were made in 1857 and 1858, but without permanent success, and the Civil war having broken out, it was not till 1866 that a cable was successfully laid by the Great Eastern. Mr. Field took an active part in establishing telegraphic communication with the West Indies, South America, etc.

Field, DAVID DUDLEY, lawyer, brother of Cyrus W., was born in Haddam, Connecticut, in 1805; died in 1894. He became especially prominent in the cause of law reform, and in 1857 was appointed president of a commission to digest the political, civil, and penal codes of New York.

Field, EUGENE, poet and journalist, born at St. Louis, Missouri, in 1850; died in 1895. He became connected with the Chicago *Daily News*, and acquired a reputation as a humorist. His poems of child life, including *A Little Book of Western Verse*, *With Trumpet and Drum*, *Second Book of Verse*, *Love Songs of Childhood*, etc., are quaint and beautiful and highly popular.

Field, MARSHALL, an American merchant, born at Conway, Mass., in 1835; died in 1906. He removed to Chicago in 1856, and in 1865 organized the firm which later became Marshall Field & Co., one of the largest mercantile houses in the world. His fortune was estimated at $150,000,000. He founded the Field Museum of Natural History (which see), and gave valuable real estate to the University of Chicago.

Field, STEPHEN J., jurist, born in 1816, at Haddam, Connecticut; was graduated 1837; studied law with his brother, David D. In 1849 he went to California and settled at Marysville. There he held various local offices; was sent to the Legislature in 1850; made judge of the State Supreme Court in 1857, and its chief justice in 1859. In 1863 President Lincoln appointed him Associate Justice of the United States Supreme Court, in which office he rendered many important decisions. An attempt was made to assassinate him in 1889 by Judge Terry, a disappointed litigant. He resigned in 1897 and died two years later.

Field Artillery, light ordnance, easy of draught, and hence fitted for rapid movements in the field.

Field Cricket, *Achēta* (*Gryllus*) *campestris*, one of the most noisy of all the crickets, larger but rarer than the house cricket. It frequents hot, sandy districts, in which it burrows to the depth of 6 to 12 inches, and sits at the mouth of the hole watching for prey, which consists of insects.

Field Fortification, FIELDWORKS, temporary works, such as trenches, rifle-pits, etc., thrown up to strengthen the position of an army in the field. See *Fortification*.

Field-glass, a binocular telescope in compact form, usually from 4 to 6 inches long. The name is also given to a small achromatic telescope usually from 20 to 24 inches long, and having from three to six joints.

Fielding (fēld'ing), ANTHONY VANDYKE COPLEY, an English painter in water-colors, born about 1787. He early attracted attention by his water-color landscapes, and for fourteen years before his death was president of the Society of Painters in Water-colors. His pictures are chiefly taken from English scenery, the various features of which, both in rich woodland and open plain, he has represented with great delicacy and truth, although latterly falling into mannerism and self-repetition. His oil-painting was not a success. He died in 1855.

Fielding, HENRY, one of the greatest of English novelists, was born at Sharpham Park, in Somersetshire in 1707. He was educated at Eton, whence he removed to Leyden; but the straitened circumstances of his father shortened his academical studies, and the same cause, added to a dissipated disposition, turned his attention to the stage. His first dramatic piece was entitled *Love in Several Masks* and was produced at Drury Lane in 1728, meeting with a favorable reception. *The Temple Beau*, *The Author's Farce*, *The Modern Husband*, *Don Quixote in England*, and many others quickly followed, a number of them being little more than free translations

from the French. He himself became a stage manager, and for some time conducted the Haymarket Theater. About 1736 or 1737 he married Miss Craddock, a lady of some fortune, and at the same time, by the death of his mother, became possessed of a small estate in Dorsetshire. He immediately commenced the life of a country gentleman on a scale which, in three years, reduced him to greater indigence than ever, with a young family to support. He then, for the first time, dedicated himself to the bar as a profession, and for immediate subsistence employed his pen on various miscellaneous subjects. *The Champion*, a periodical paper on the model of the *Spectator*, but written in a freer style, and *An Essay on the Knowledge and Characters of Men*, were among the early fruits of his literary industry. In 1740 he was called to the bar, and went on circuit, but with so little success that he was compelled to return to literature. In 1742 the first of his great novels, *Joseph Andrews*, appeared, which he had at first conceived as a burlesque of Richardson's *Pamela*. It was a great success, and was followed by *A Journey from this World to the Next*, and *The History of Jonathan Wild*. In 1749 he was appointed a Middlesex justice, a not very reputable office, but which Fielding's honesty and earnest discharge of his duties did something to render more respectable. In the same year his masterpiece, *The History of Tom Jones*, appeared, and was followed two years afterwards by *Amelia*. At length, however, his constitution, exhausted both by hard work and reckless living, gave way, and in the June of 1754 he had to seek the milder climate of Lisbon, where he died 8th October of the same year. The chief merits of Fielding as a novelist are wit, humor, correct delineation of character, and knowledge of the human heart. He drew from a very varied experience of life, which he reproduced with an artistic realism entitling him to be considered, far more than Richardson, as the creator of the English novel.

Field-marshal, the highest military dignitary in Britain, Germany, and other countries. In Britain the dignity is conferred by selection and enjoyed by but very few officers, and chiefly for distinguished services or on the ground of royal descent. It was introduced into Britain by George II, in 1736.

Field Mouse. See *Mouse*.

Field Museum, an art museum established in Chicago by Marshall Field, a wealthy merchant of that city (1835-1906). It occupies the Fine Art Building of the Chicago Exposition of 1893, and was endowed with $1,000,000 by Mr. Field. In his will he left $8,000,000 more to it.

Field Officers, in the army, those competent to command whole battalions—majors, lieutenant-colonels, colonels, as distinguished from those entrusted with company duties, as captains and lieutenants.

Field of the Cloth of Gold, a spot in the valley of Andren, between the English castle of Guisnes and the French castle of Ardres, celebrated for the meeting (7th June, 1520), between Henry VIII of England and Francis I of France, attended by the flower of nobility of both nations. The diplomatic results were little or nothing, and the event is now memorable only as a grand historical parade.

Fieschi (fē-es'kē), JOSEPH MARIE, conspirator, born at Murato, in Corsica in 1790. He served for some years in the French army, and in the Neapolitan army of Murat. Having returned to his native land, he was convicted of robbery and sentenced to ten years' imprisonment. After the revolution of 1830 he appeared in Paris and by means of forged papers obtained a small pension and an appointment under the pretense that he had been a victim of the Restoration. Being afterwards deprived of his appointment he resolved to avenge the slight by assassinating Louis Philippe, which he attempted by an infernal machine on 28th July, 1835. The king escaped with a slight scratch, although a number of persons around him were killed. Fieschi was guillotined Feb. 19, 1836, along with two of his accomplices.

Fiesole (fē-ez'o-lā; anciently *Fæsulæ*), a small town of Italy, 3 miles northeast of Florence, on the top of a steep hill. It has a cathedral and is the seat of a bishop. Anciently it was an important Etruscan city, and still has some Etruscan remains. Pop. 4951.

Fiesole, FRA GIOVANNI DA. See *Angelico*.

Fife (fif), a small instrument of the flute kind, pierced with six finger-holes, and usually having one key. Its ordinary compass is two octaves from D on the fourth line of the treble staff upwards. A combination of fifes and drums is the officially recognized music in the British and American army and navy.

Fife, or FIFESHIRE, a maritime county of Scotland, forming the peninsula between the Firths of Forth and Tay; area 504 sq. miles. The surface

is undulating, the highest elevation being 1720 feet. The principal valley, called Strath Eden, or the 'Howe (hollow) of Fife,' watered by the Eden, is very fertile, highly cultivated, and thickly studded with beautiful mansions and villas. Very fertile also is the district lying along the shores of the Firth of Forth, and remarkable for the number of towns and villages with which it is lined. The northern sections are generally infertile. Fife is the third largest coal-producing county in Scotland. Iron, limestone, and freestone abound. The chief manufacture of the county is linen, damasks, diapers, checks, ticks, etc.; the first two principally at Dunfermline, the last two at Kirkcaldy. There are salmon and other fisheries. The principal towns are Dunfermline, Kirkcaldy, St. Andrews, and Cupar, the county town. Pop. 218,843.

Fifth, in music, an interval consisting of three tones and a semitone. Except the octave, it is the most perfect of concords. Its ratio is 3:2. It is called the fifth, as it comes, by diatonic ascent, in the fifth place from the fundamental or tonic. See *Music.*

Fifth Monarchy Men, a sect of politico-religious enthusiasts who during the protectorate of Cromwell assumed to be 'subjects only of King Jesus.' They considered the revolution as the introduction to the *fifth* great monarchy which was to succeed to the four great kingdoms of Antichrist mentioned by Daniel (the Assyrian, the Persian, the Grecian, and the Roman), and during which Christ was to reign on earth 1000 years.

Fig (*Ficus Carica*), a deciduous tree belonging to the order Moraceæ

Fig (*Ficus Carica*).—*a*, Fruit shown in section.

(mulberry). It is indigenous to Asia Minor, but has been naturalized in all the countries round the Mediterranean. It grows from 15 to 20 or even 30 feet high. In congenial climates it bears two crops in a season, one in the early summer from the buds of the last year; the other (which is the chief harvest) in the autumn, from those on the spring growth. The fruit is a hollow receptacle produced in the axils of the leaves on small round pedunclés, and containing a great multitude of minute flowers, the ripe carpels of which are embedded in the pulp. The flowers are male and female, the former situated near the orifice at the top, the latter in that part of the concavity next the stalk. Figs, particularly dried figs, form an important article of food in the countries of the Levant, and are exported in large quantities to America and Europe. The best come from Turkey.

Figaro (fig'a-rō), a dramatic character first introduced on the French stage by Beaumarchais in his comedies, the *Barber of Seville* and the *Marriage of Figaro.* Figaro is a barber remarkable for his shrewdness and dexterity in intrigue. The plays were adapted for Mozart's *Marriage of Figaro* and Rossini's *Barber of Seville.* The name is also well known as that of satirical journals published in Paris and London.

Figeac (fē-zhâk), a town of France, department Lot, 42 miles E.N.E. of Cahors. It is an ancient place, and consists chiefly of narrow, crooked streets and antiquated houses with quaint Gothic fronts. Pop. 4480.

Fighting-fish (*Macropŏdus* or *Ctenops pugnax*), a small fish of the family Anabasidæ (climbing perch), a native of the southeast of Asia, remarkable for its pugnacious propensities. In Siam these fishes are kept in glass globes, as we keep gold-fish, for the purpose of fighting, and an extravagant amount of gambling takes place about the result of the fights. When the fish is quiet its colors are dull, but when it is irritated it glows with metallic splendor.

Figueras (fi-gā'räs), a town of Spain, in the province of and 21 miles N. N. E. of Gerona, near the French frontier, defended by a fortress reputed the strongest in Spain. Pop. 10,714.

Figueras, Estanislao, a Spanish statesman, born in Barcelona in 1819; died in 1882. A leader in the liberal party of Catalonia, he was elected to the Cortes in 1850, and after the dethronement of Queen Isabella was prominent in organizing the republican

party. After King Amadeo abdicated, in 1873, Figueras was provisional president for about four months, being the only president Spain has ever known. He afterwards retired to private life.

Figuier (fē-gē-ā), LOUIS, a French writer of popular works on science, born 1819; became professor in the School of Pharmacy, Paris. Among his works are *Histoire du Merveilleux dans les Temps Modernes; L'Alchimie et les Alchimistes; Vies des Savants Illustre depuis l'Antiquité jusqu'au XIX Siècle; Les Grandes Inventions; Le Tableau de la Nature;* etc. Several of his works have been translated into English, including different sections of the one last mentioned. He died in 1894.

Figuline (fig'ū-lin), a name given by mineralogists to potter's-clay.

Figural (fig'ū-ral; or FIGURATE) NUMBERS, numbers formed by the terms of arithmetical series of all sorts, in which the first number is always unity. For example:

I.—1, 2, 3, 4, 5, 6, etc.
II.—1, 3, 6, 10, 15, 21, etc.
III.—1, 4, 9, 16, 25, 36, etc.
IV.—1, 5, 12, 22, 35, 51, etc.

Those in the second row are called *triangular* numbers, because their units may be arranged in equilateral triangles; the members of the third row are called *square* numbers; those of the fourth *pentagonal*, etc.; and so there are also *hexagonal, heptagonal*, and, in general, *polygonal* numbers.

Figurehead, the ornamental figure or bust on the projecting part of a ship's stem, over the cutwater and immediately under the bowsprit.

Figworts, the common name of the *Scrophularia*, and sometimes also applied to the Scrophulariaceæ, a large natural order of exogenous plants represented by the calceolaria, foxglove, veronica, etc.

Fiji (fē'jē), FEEJEE, or VITI ISLANDS, an island group, South Pacific Ocean, east of the New Hebrides, between lat. 15° 30′ and 19° 30′ S.; and lon. 177° E. and 178° W. The entire group which was discovered by Tasman in 1643, comprises altogether 254 islands and islets, eighty of which are inhabited; total area about 8000 sq. miles. Two of the islands only are of large size, namely, Viti Levu, 90 miles long by 60 wide; and Vanua Levu, rather longer, but much narrower and more irregular. Next to these come Taviuni and Kandavu. The islands are of volcanic origin, extremely fertile, and covered with a luxuriant foliage, especially on the east side. The peaks are usually basaltic cones or needles, some of which rise to the height of several thousand feet. The coasts are almost surrounded with coral reefs, and where the shore is not precipitous the beach is formed of fine coral sand. The cocoanut palm grows along the sea coasts; the breadfruit, banana, and pandanus are abundant; the orange, taro yams, sweet potato, and since the commencement of European settlements, maize, tobacco, and the sugar cane are cultivated; timber trees, including the chestnut are plentiful; sandalwood is now scarce. The birds are wild ducks, pigeons, and domestic fowl, parrots and other tropical species. Except the stock introduced there are hardly any animals. Fish are plentiful. The natives enclose and cultivate their lands, the women performing most of the manual labor. The climate on the whole is healthy and agreeable for Europeans. The Fijians are a dark-colored, frizzly-haired, bearded race of Melanesian extraction, although intermixed with the Polynesians of Tonga and Samoa. They are cleanly in their habits, and are generally regarded as superior to the Polynesians in intelligence. Their early character, however, was bad. Cannibalism was reduced to a system, and wives, children, and friends were often sacrificed to the fondness for human flesh. Cannibalism seems now to be abolished. This result has been due to the Christian missions, mostly Wesleyan, which have been very successful, most of the native population having become professed Christians. From 1866 onwards the influx of European settlers from New Zealand and the Australian colonies gradually brought the trade of Fiji into importance, and repeated applications were made to the British government, both by the settlers and the king, Thakombau, to annex the islands. At length, in 1874, this was done, and the Fiji Islands were made a crown colony, under a governor, assisted by an executive council and legislative assembly, both either officials or nominated by the governor. Native chiefs take part in the administration, the old customary law being still largely adhered to. Since the annexation the prosperity of the colony has been remarkable. The chief article of export is sugar; the next is copra, the dried kernels of the cocoanut. The other important exports are cotton, molasses, coffee, etc. The demand for labor has led to the introduction of some 6000 coolies from India. In 1911 the population was 189,541. The Europeans number about 2500. The capital is Suva, on the south coast

of Viti Levu. The island of Rotumah, to the north, was annexed to Fiji in 1881.

Filaria, a genus of nematodes or round-worms, which includes some parasites dangerous to man. The guinea-worm (*F. medinensis*), which occurs in parts of Africa, forms cutaneous abscesses on the back and legs. The larva inhabits cyclops, a water flea, and is swallowed with dirty water. It is apparently only the female which is parasitic, and it reaches a length of from 20 to 30 inches. The disease caused by these nematodes is called filariasis.

Filbert (fil'bert), the fruit of a cultivated variety of *Corylus Avellāna* or hazel. See *Hazel*.

File (fil), a bar of cast steel with small, sharp-edged elevations on its surface called teeth, the use of which is to cut into or abrade metals, wood, ivory, horn, etc. Files are of various shapes, as flat, half-round, three-sided, square, or round, and are generally thickest in the middle, while their teeth are of various degrees of fineness and of different forms. A file whose teeth are in parallel ridges only is called *single-cut* or *float-cut*. Such are mostly used for brass and copper. When there are two series of ridges crossing each other the file is *double-cut*, which is the file best suited for iron and steel. *Rasps* are files which have isolated sharp teeth separated by comparatively wide spaces, and are chiefly used for soft materials such as wood and horn. Each of these three classes of files is made in six different degrees of fineness, the coarsest being called *rough*, the next *middle*, followed by *bastard*, *second-cut*, *smooth*, and *superfine* or *deadsmooth*, each a degree finer than that which precedes it. Formerly all files were made by hand, the steel bar or *blank* after being forged and ground smooth was laid on the anvil and the teeth struck up with a chisel. Now, however, all the essential operations are performed by machinery. The first commercially practical machine for cutting files was invented by W. T. Nicholson, of Providence, R. I. This machine with improvements and modifications is widely used at present. A new and ingenious file has recently been developed in which semi-circular teeth are cut in the face of the blank. Files of this type are self-cleaning and not apt to clog up in filing soft metals like lead and brass.

File, a row of soldiers ranged one behind another from front to rear. When a column is arranged two deep, a file is thus two men.

File-fish, a name given to certain fishes from their skins being granulated like a file; they constitute the genus *Balistes*. *B. capriscus*, a common inhabitant of the Mediterranean, has the power of inflating the sides of the abdomen at pleasure, and grows to the size of 2 feet. *B. aculeatus* is a native of the Indian and American seas.

Filibuster (fil'i-bus-ter), a name given to those adventurers, chiefly from the United States, who endeavored to effect settlements on the Spanish islands and colonies in Central America. The term is of Spanish origin, but is ultimately from the English *fly-boat*, referring to the small fast-sailing vessels used by the buccaneers in the 17th century. Among the most noted of the filibusters was William Walker, who made three expeditions to Nicaragua (1855, 1857, 1860). Also applied to partisans in a legislative assembly who impede legislation by dilatory tactics.

Filicaja (fe-le-kä'yä), VINCENZO DA, an Italian poet, born in 1642 at Florence of a noble family. The publication of his odes, sonnets, etc., in 1684 established Filicaja's fame as the first poet of his time in Italy. The Grand-duke of Tuscany appointed him governor of Volterra, and then of Pisa, in which posts he gained the esteem equally of people and sovereign. He died in 1707. Among his most successful poems are the *Canzone* to John Sobieski on the occasion of the relief of Vienna from the Turks, and the celebrated sonnet on Italy, imitated by Byron in the 4th canto of *Childe Harold*, stanzas 42, 43.

Filigree (fil-i-grē'), a kind of ornamental open work in gold or silver, wrought delicately in the manner of little threads or grains, or of both intermixed. The art was practised by the Etruscans and the Greeks of the Byzantine Empire. In the 17th century it was carried to great perfection in Italy, and silver filigree work is still largely manufactured in the south of Europe. Some of the eastern nations, especially the Chinese and Malays, show great skill in the manufacture of silver filigree.

Filipo d'Argiro, SAN. Same as *Agira*.

Fillan (fil'an), ST. Two saints of this name, who flourished in the 7th and 8th centuries, appear in the church calendars.—(1) ST. FILLAN, or FAOLAN, the leper, whose annual festival is the 20th of June. His principal church in Scotland was at the lower end of Loch Earn, in Perthshire, where 'St. Fillan's Well' was long believed to have wonderful healing properties.—(2) ST. FILLAN, the abbot, the son of St. Kentigerna in Inchcailleach, in Loch Le-

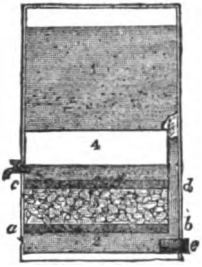
mond, had his chief church also in Perthshire, in Strathfillan, the upper part of Glen Dochart. The silver head of this abbot's crozier, entrusted by King Robert Bruce to the Dewar family, is now in the Antiquarian Museum, Edinburgh.

Fillet (fil'et), in architecture, a small molding, generally rectangular in section, and having the appearance of a narrow band, generally used to separate ornaments and moldings.

Fillmore (fil'mōr), MILLARD, the thirteenth President of the United States, was born in Cayuga Co., New York, in 1800; died in 1874. First a teacher, then a lawyer, he was elected to Congress in 1832, and was re-elected by the Whig party in 1836, 1838 and 1840, and was the chief author of the tariff of 1842. He was a candidate for Governor of New York in 1844, was elected comptroller of that State in 1847, and was elected Vice-President of the United States in 1848, General Taylor being chosen President. On Taylor's death, July 9, 1850, he became President. His term was one of great political irritation, and he gave much offense to the Northern Whigs by signing the bill for the return of fugitive slaves. He was the candidate of the American party for the presidency in 1856, but received no electoral votes but those of Maryland.

Film. A term used in photography for a flexible sheet of celluloid or like material covered with a sensitized coating for the taking of pictures. Films are produced in the form of a rolled ribbon or in cut sheets for plate holders or special containers. They are chiefly used by amateur photographers and for the production of moving pictures.

Filtration (fil-trā'shun), the process of freeing a liquid from solid matter suspended in it by causing it to pass through some previous substance or substances which catch and retain the solid matter. The materials of which a filter is composed must have pores or interstices sufficiently coarse to allow the passage of the liquid, and yet sufficiently fine to prevent the passage of any solid particles. On a small scale unsized paper is generally used; but on a large scale various kinds of stone, sand, gravel, powdered glass, clay, porous sulphur, preparations of iron, charcoal, cloth, felt, horsehair, skins, silicated carbon, sponge, wood, wool, cane, capillary threads, etc., are all employed. In domestic filters the simplest forms are those in which the water passes down by its own gravitation through the filtering medium to a reservoir below. Lateral and ascending filtration are not uncommon. One of the most successful forms of ascending filter is divided into four compartments, as seen in the figure. The uppermost part, containing the water to be filtered, communicates with the lowest by a tube having a loose sponge at its mouth to stop some of the impurities. The top of the lowest compartment is composed of a porous slab, through which the water passes into the third part, which is filled with charcoal. The water is finally forced through the charcoal and another slab into the remaining compartment, which is furnished with a tap to draw off the filtered water. The filters at waterworks are large tanks or beds, made of good clay and filled with layers of large stones, pebbles, and coarse gravel, fine gravel, coarse sand and fine sand—the fine sand being at the top. Other materials are sometimes utilized, such as furnace cinders or clinkers, shells or shell-sand, and so forth. The water in the reservoir, collected from springs, surface drainage, and rain, is allowed to deposit its suspended matter in settling-tanks, and then it is run into the filters. By percolation the rest of the mineral matter is removed, and the water then flows into the mains which are to convey it to the locality where it is to be used. Filtration can remove only the substances mechanically suspended in the liquid. In order to remove dissolved substances distillation is necessary. In addition to these mechanical methods of filtration, chemical methods are also in use, foreign substances being removed from the water by chemical processes. The water-supply of many cities is now purified by filtration on a great scale, the last notable example of this being the supply of Philadelphia, where an admirable system of sand filtration has been introduced during the last decade, with excellent results in removing the pernicious bacteria and reducing the prevalence of typhoid and other water-borne diseases.



LELOGE'S WATER FILTER.

1 2 3 4, The compartments; *a b*, porous top of 2d compartment; *c d*, filtering top of 3d compartment; *e*, movable plug.

Finale (fē-nä'lā), the concluding part of a musical composition, for instance, of a quartette, of a symphony,

of any act of an opera, of a ballet, etc. It consists of compositions of various characters.

Finance (fi-nans'), the system or science of public revenue and expenditure. In the plural the term is applied to the income or revenue of a state, to the funds in the public treasury, and also to private income or resources. See in this connection such articles as *Exchequer*, *National Debt*, *Tax*, *Bank*, etc.

Finback, or FINNER, a name given to the species of a genus of whales (*Physălus*), so called from their possessing a dorsal hump or fin. The name is also sometimes given to the members of the genus *Balænoptĕra* or rorquals.

Finch (finsh), one of the Fringillidæ, a large family of small seed-eating birds, inhabiting all parts of the globe, and belonging to the order Insessores, section Conirostres. They are distinguished by having a sharply-pointed, conical, and in most cases a strongly-formed bill, suitable for crushing seeds and other hard objects. The species have been divided among several sub-families, as the hawfinches, the true finches, the buntings, the larks, the bullfinches, etc.

Finch, HENEAGE. See *Nottingham, Earl of.*

Finden (fin'den), WILLIAM, line engraver, born in 1787; died at London in 1852. He engraved many illustrations for the *Annuals* and other books. In conjunction with his younger brother Edward and assistants he produced several extensive series of engravings of great merit; the first and most successful of which was *Illustrations of the Life and Works of Lord Byron.* Other series followed, including the *Royal Gallery of British Art*, 1838-40, a very important publication, the engravings in which measure 13½ x 9½ in., and are of the highest class. The plates are executed by various engravers of the foremost rank. Besides his book-plates, Finden produced some celebrated large engravings, among which may be mentioned *The Village Festival*, after Wilkie, *George IV*, after Sir Thomas Lawrence.

Findlay (find'lā), a city, county seat of Hancock Co., Ohio, 43 miles S. of Toledo, on the Blanchard River. It is in the oil and natural gas region of Ohio and has extensive manufactures of automobile trucks, beet sugar, clay and porcelain ware, machine, boiler, engine and bridge works, etc. Pop. 16,325.

Findhorn (find'hōrn) a Scotch salmon river which flows through the counties of Inverness, Nairn, and Elgin, and falls into the Moray Firth after a course of 62 miles.

Fine (fīn), in English law, formerly signified a sum of money paid at the entrance of a tenant into his land and on other occasions, but now has the signification of a pecuniary penalty exacted either in punishment of, or in compensation for, an offense, whether committed against an individual, in contravention of the laws of the community, or against the community itself.

Fine Arts, the arts whose object is the production of pleasure by their immediate impression on the mind, as architecture, poetry, music, painting, and sculpture. In modern usage the term is often restricted to the imitative arts which appeal to us through the eye—namely, painting, sculpture, engraving, architecture, and is sometimes even restricted to the first two as more essentially imitative and imaginative.

Fingal (fin'gal), a hero of Gaelic romance, celebrated as a great warrior and a generous man in many old ballads belonging alike to Ireland and Scotland; but more especially the hero of an epic poem attributed to Fingal's son Ossian, first published by James Macpherson in 1762. See *Ossian.*

Fingal's Cave, a famous natural cavern in the island of Staffa, one of the western Islands of Scotland. It extends 227 feet from its mouth inward, is composed of lofty basaltic columns, beautifully jointed, and of most symmetrical, though somewhat varied forms. The height from the top of the arched roof to the mean level of the sea is 66 feet; the breadth at the entrance 42 feet, at the end of the cave 2 feet.

Finger-print System. Impressions of finger-prints as a means of identification for police purposes are taken in two ways: 'rolled' and 'plain.' To take a 'rolled' impression the bulb of the finger is placed on the inked slab, and the finger turned over until the bulb, which originally faced to the left, faces to the right. It is then pressed lightly and in the same way upon paper. A plain impression is secured by placing the bulb of the finger on the inked slab and then impressing it on the paper without any turning movement. These impressions are placed on sheets marked out for the purpose, and filed. The system has been adopted in the United States, where it is used in the police departments, in the War Office and in the Marine Corps.

Finial (fin'i-al), in architecture, an ornamental bunch of foliage which terminates pinnacles, canopies, pediments, etc., or any ornament of like kind.

By older writers the term is used to denote not only the leafy termination, but the whole pyramidal mass.

Finiguerra (fē-nē-gwĕr'rȧ), TOMMASO, or MASO, a Florentine goldsmith of the 15th century, one of the best workers in *niello*, a form of decorative art then much in vogue in Italy, and the inventor of the method of taking impressions from engraved plates.

Fining (fī'ning), a substance used to clarify liquors, usually such as are out of condition or are of inferior quality. A solution of isinglass is generally used for beer, and alum, carbonate of soda, salt of tartar, etc., for spirits. Finings always destroy some of the real virtue of the liquor.

Finistère (fī-nis-tăr; 'Land's End'), a department of France, so named from occupying its westernmost extremity: area, 2595 square miles. The coast-line is bold and precipitous, composed almost throughout of lofty granite cliffs, in which are numerous deep indentations, the two most important of them forming both the bay of Douarnenez and the roadstead of Brest. The interior is traversed by hills which extend in all directions. The soil is generally fertile and well cultivated; fishing is extensively carried on; and the minerals are of considerable importance, including iron, zinc, bismuth, and lead. The manufactures consist chiefly of sailcloth, linen, soap, oil, candles, ropes, leather, paper, and tobacco. Shipbuilding also is carried on, and the general trade is extensive. Quimper is the capital; other towns are Brest, Châteaulin, and Morlaix. Pop. (1906) 795,103.

Finisterre, CAPE, the most western cape of Spain, on the coast of Galicia.

Finland (fin'land), a Russian grand-duchy, containing 134,829 sq. miles, bounded N. by Norway, E. by the governments of Olonetz and Archangel, S. by the Gulf of Finland, W. by Sweden and the Gulf of Bothnia. The capital is Helsingfors. The country, in some parts, is hilly, being traversed by the continuations of the Scandinavian Mountains, and, in others, is sandy, marshy, and abounding in lakes, which furnish one of the most characteristic features of the scenery. The rivers are unimportant for navigation, but yield much motive power and are rich in fish. Tillage and cattle-breeding are carried on to some extent; but the most valuable exports are the products of the forests, timber, pitch, tar, and rosin. More than half of them belong to the state, and the management of this portion is carefully regulated, while the private owners handle their estates wastefully. The fauna of Finland is very rich, all domestic animals thrive, the horses being notable for speed, hardihood, and docility. The climate is severe, but healthy; the mean yearly temperature in the north is 27.5° F., at Helsingfors 38.7°. The principal minerals are iron and copper; granite is extensively quarried. The inhabitants are mostly Finns (see *Finns*) and Swedes, with a few Lapps, Russians, and Germans. Up to the twelfth century the Finns lived under their own chiefs and were pagans. Their conversion to Christianity took place about the middle of that century, after their conquest by the Swedes. In 1721 the part of Finland which formed the province of Wiborg was secured to Peter the Great by treaty. The remainder was conquered from the Swedes in 1809, and Alexander I, the Czar of Russia, agreed that the laws, liberties, and religion of the country should be faithfully preserved. These resembled those of Sweden, the religion being Lutheran, though there was complete religious freedom, the government being based on the Swedish system. There was a national parliament, or diet, consisting of four estates, the nobles, the clergy, the burgesses, and the peasants, the sessions being convoked by the grand-duke, the Emperor of Russia. The senate, the members of which were nominated by the crown, held the superior administrative power, its sessions being at Helsingfors under the presidency of a governor-general, who represented the emperor. All other officials, as well as the officers of the army, were required to be Finnish subjects. Under this system of government Finland was the first part of the Russian empire, possessing a partial independence not agreeable to the czars. The agreement made by Alexander, however, was retained until 1898, when the Czar Nicholas II issued an edict restricting the rights of the people, and robbing them in a measure of their autonomous government. Other oppressive ordinances were issued from 1901 to 1903, with the purpose of bringing Finland into conformity with the remainder of Russia, but causing a rebellious discontent which, in 1904, led to the assassination of a tyrannical Russian governor-general by a Finnish patriot. The outbreak of revolutionary sentiment throughout Russia in 1905, after the war with Japan, led to a restoration of the former government of Finland. In the following years a system of universal suffrage was adopted, women being given

the right to vote and to sit in the Diet. New oppressive acts gave rise to fresh discontent when it became evident that more attempts were to be made at the Russification of Finland. The opening of the Great war pushed Finland affairs temporarily into the background, but following the revolution in Russia (1917) the separatists of Finland declared their country independent. The Bolshevik government of Russia contested this declaration, and the hostilities which broke out gave Germany her opportunity to intervene. She occupied Helsingfors in April, 1918. Recognition of the independence of Finland was made by France, Denmark and Germany.

Finland, GULF OF, a great arm of the Baltic, 250 or 260 miles long and from 10 to 70 miles wide, stretching from W. to E. between Finland on the N. and the Russian governments of Esthonia and St. Petersburg on the S. Its waters are only slightly salt. It contains numerous islands, several excellent harbors and strong fortresses.

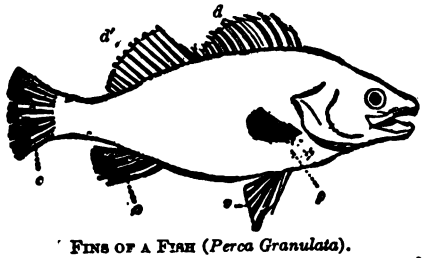
Finlay (fin'lā), GEORGE, historian, born of Scotch parents at Faversham, Kent, in 1799; died in 1875. He was educated, chiefly at Glasgow, for the legal profession, but, stirred by the cause of Greek independence, he went to Greece in 1823, and thenceforward lived chiefly at Athens devoted to the service of his adopted country. His chief work, the *History of Greece from its Conquest by the Romans to 1864*, was published in sections under different titles: *Greece under the Romans; History of the Byzantine Empire*, etc.

Finmark (fin'mark), a division of Norway, in the extreme north, partly bounded by the Arctic Ocean. It consists of a mountainous and usually sterile tract, stretching 140 miles northeast to southwest, with an average breadth of about 40 miles. The Loffoden Islands belong to a long line of coast where important fisheries are established. The cod-fishery employs a large number of boats and men, and a great quantity of cod-liver oil is made. Pop. 32,735.

Finner. See *Finback*.

Finns, in their own language called *Suomalainen*, are a race of people inhabiting the northwest of European Russia (governments of Archangel and Olonetz), but especially the grand-duchy of Finland. In a wider sense the term Finns, with its adjective Finnic, is applied to one of the chief branches of the northern or Uralo-Altaic division of the Turanian family of peoples and languages. The Uralo-Finnic family has been divided into four groups or branches: 1, the Ugric, to which the Ostiaks, Voguls, and Magyars belong; 2, the Bulgaric or Volgaic, consisting of the Tcheremisses and the Mordvins; 3, the Permic, composed of the Permians, Sirianes, and Votiaks; and 4, the Chudic or Baltic group. To the last belong, besides the Finns proper, the Esths of Esthonia and the Lives or Livonians, the Chudes, in the governments of Novgorod and Olonetz, and the Lapps in Archangel and the northern parts of Finland, Sweden, and Norway. The typical Finns are physically of low stature but of strong build; with round head, forehead low and arched, features flat with prominent cheek bones, and oblique eyes. Their language belongs to the northern division of the Turanian or Uralo-Altaic family of languages, and is most nearly allied to the languages of the Esths, Lapps, Mordvins, Voguls, and Hungarians. It is agreeable to the ear, rich in vowels and diphthongs, copious, and uncommonly flexible. The language is remarkably rich in declensional forms, there being as many as fifteen different cases, expressing such relations as are expressed in English by *near*, *to*, *by*, *on*, *in*, *with*, *without*, *along*, etc. There is no distinction of gender in nouns. The verb resembles the noun in its capability for expressing shades of meaning by corresponding inflections. Finnish literature is valuable chiefly for its rich stores of national poetry. These poems, which had been preserved by oral tradition from the times of heathendom, were gradually dying out, till 1835, when Lönnrot grouped together in one whole all the fragments he could lay his hands on and published them, under the title of *Kalevala*, as the national epic of the Finnish people. A second edition, increased almost by one-half, was published by him in 1849. He also published a collection of 592 ancient lyric poems and 50 old ballads, and collections of proverbs and riddles. A great impulse has been given to the cultivation of the language in modern times. It is now recognized as an official language side by side with Swedish, and is becoming more and more the vehicle for imparting instruction. In many of the higher educational institutions for both sexes in Finland the Finnish language is used. Works on science and history as well as poetry have been written in Finnish in recent years; a great Finnish-Swedish dictionary has been published, and there are now a considerable number of newspapers. The center of this literary life is the city of Helsingfors.

Fins, the projecting wing-like organs which enable fishes to balance themselves and assist in regulating their movements in the water. The fin consists of a thin, elastic membrane supported by rays or little bony or cartilaginous ossicles. The *pectoral* or breast fins are never more than two; they are placed immediately in the rear of the gill opening on the shoulder. In a state of rest these fins are parallel with



Fins of a Fish (*Perca Granulata*).
p, Pectoral. *v*, Ventral. *d*, First Dorsal. *d'*, Second Dorsal. *c*, Caudal. *a*, Anal.

the body, and have the apex towards the tail. The *ventrals*, or abdominal fins, are placed under the throat or belly, and point downwards and backwards. They are smaller, in general, than the pectorals, and have sometimes long appendages. Those of the back, or the *dorsal* fins, point upwards and backwards, and vary in number from one to four, to which sometimes are added several finlets or *pinnulæ*—small appendages which are seen in the mackerel. The *anal* fins are situated behind the vent, varying in number from one to three, placed vertically, and, like the dorsal, generally deeper on the anterior margin. The *caudal*, or tail fin, terminates the body, and both propels the fish and serves as the rudder by which it steers itself. The pectoral and ventral are known as *paired* fins, and represent the fore and hind limbs of other vertebrates; the dorsal, anal, and caudal are *median*, *vertical*, or *unpaired* fins, and are organs peculiar to fishes.

Finsbury (finz'ber-i), a parliamentary borough of England, forming part of London, bounded by the parliamentary boroughs of St. Pancras, Islington, Shoreditch, London City, and Westminster. Pop. (1911) 87,976.

Finsen Light Cure, invented by Prof. Niels R. Finsen, of Copenhagen (died Sept. 24, 1904), is used for the cure of lupus, acne, erysipelas, and similar eruptions, and in combination with x-rays for deep-seated cancers. The Finsen lamp consists of a powerful electric light focusing through telescopes of colored glass on the diseased surfaces requiring treatment.

Finster-Aarhorn (fin'ster-är'horn), the highest peak of the Bernese Alps, 14,026 feet above the level of the sea.

Finsterwalde (fin-s t e r-v å l'd e), a town in the province of Brandenburg, Prussia, with manufactures of cotton and woolen cloths. Pop. 10,726.

Fion, Fionn (fē'on), a name given in the Ossianic poetry to a semi-mythical class of warriors of superhuman size, strength, speed, and prowess. Generally they are supposed to have been a sort of Irish militia, and to have had their name from *Fion* MacCumhal (the Finn MacCoul of Dunbar, and Fingal of Macpherson), their most distinguished leader; but Mr. Skene believes them to have been of the race that inhabited Germany before the Germans and Scotland and Ireland before the Scots.

Fiord (fyord), a geographical term (of Scandinavian origin) applied to long, narrow, and very irregularly-shaped inlets of the sea, such as diversify the coast of Norway. Similar inlets of the sea are presented in the sea-lochs of the west coast of Scotland, as also in the fiords on the southwest coast of the South Island of New Zealand, where the scenery is singularly imposing. Fiords often seem to owe their origin to the action of glaciers in remote epochs of the earth's history.

Fiorin (fī'ur-in; *Agrostis alba*), or white-top, a grass found in Northern States of America. It is not of much agricultural value. A stoloniferous variety, sometimes called *A. stolonifĕra*, is often a troublesome weed.

Fir (fĕr), a name sometimes used as co-extensive with the term *pine*, and including the whole genus *Pinus;* sometimes restricted to trees of the genus *Abies*, which differ from the pines in their leaves growing singly, and the scales of the cones being smooth, round and thin. The term fir, thus limited, is applied to the different varieties of the *silver fir* and the *spruce fir*, the common silver fir being the *Abies picĕa* of botanists, while the common or Norway spruce is the *Abies excelsa*. Other species are the great Californian fir (*A. grandis*), the balm of Gilead fir (*A. balsamifĕra*), the large-bracted fir (*A. nobilis*), the hemlock spruce fir (*A. Canadensis*), oriental fir (*A. orientālis*), white spruce fir (*A. alba*), Douglas fir (*A. Douglasii*), etc. The Scotch fir is

a species of pine (*P. sylvestris*). The firs, even in the widest sense of the term, are almost all remarkable for the regularity of their growth, their tapering form, and the great altitude of their stems. Their timber is often highly valuable, being almost solely used in the construction of houses, and for the spars and masts of vessels of all kinds. Some of them are planted mainly as ornamental trees. By some botanists the larch and cedar are included with the firs in the genus *Abies*. See *Spruce, Silver Fir, Hemlock*, etc.

Firbolgs (fir'bolgz), one of the legendary or fabulous tribes of the earliest period of Irish history. Some of the Irish historians begin their account of the Irish monarchy and list of kings with Slainge, the first Firbolg king, who began to reign 1934 B.C. They are said to have been driven out or subjugated by a kindred tribe from Scotland, who in turn were expelled or conquered by the Milesians. The Firbolgs may, it has been thought, corresponded to the pre-Aryan inhabitants of Ireland.

Firdusi (fir-dū'sē), or FIRDAU'SI, ABUL KASIM MANSUR, the greatest epic poet of the Persians, was born at Khorassan about 931, and died there about 1020. At the request of the Sultan Mahmud, of Ghuznee, Firdusi undertook to write an epic on the history of the Persian kings, the sultan promising him a piece of gold for each verse. Firdusi devoted a great number of years to this work, and produced an historical poem of 60,000 verses, entitled *Shanameh* ('Book of the Kings'), containing the history of the Persian rulers from the beginning of the world to the downfall of the Sassanian dynasty (632 A.D.), and consisting properly of a succession of historical epics. The sultan, prejudiced against Firdusi by the poet's enemies, gave him only a piece of silver for each verse. In return Firdusi retaliated with one of the bitterest and severest satires ever penned. The resentment of Mahmud compelled the poet to wander from court to court seeking a protection which the sovereigns were afraid to give. The *Shanameh* is one of the finest Asiatic poems. No work in the Persian language can be compared with it. It abounds in rich imagery, contains many passages of splendid poetry, and is of great interest to historians and ethnologists. A French translation of the *Shanameh* by Mohl, with the Persian text, was published by the French government.

Fire (fīr), the simultaneous and vividly perceptible evolution of heat and light during the process of combustion. The uses and dangers of fire, and to some extent the means of controlling it, have been generally understood from a very early period. The symbolic and superstitious uses of fire are numerous, and have been, or are, common to all races. Anciently fire was regarded as one of the four elements of which all things are composed, the other three being *air, earth*, and *water*. See *Combustion* and articles following this.

Fire-alarm, an apparatus, mechanical, electrical, and telegraphic, used for detecting fires, and for giving instantaneous notice of an outbreak. Detectors are often placed in the different apartments of a building, which ring an alarm when the temperature reaches a certain height. In large towns a series of signal-boxes is distributed in different quarters from which an alarm can be immediately telegraphed to the fire-brigade station.

Fire Annihilator. See *Extincteur.*

Fire Armor, a device to protect firemen and others from the effects of smoke, gas, etc. Devices of this kind have been in use in the United States since 1823. Methods are employed to protect the face, and by a wet sponge to keep out dust, smoke and noxious gases from the lungs, while cooling the air respired. Also the firemen are supplied with fresh air through a pipe connected with the face-mask.

Firearms, a general name for all sorts of guns, rifles, fowling-pieces, blunderbusses, pistols, etc., which effect their discharge by the combustion of gunpowder.

Fireball: (1) A ball filled with powder or other combustibles, intended to be thrown among enemies, and to injure by explosion, or to set fire to their works. (2) A popular name applied to a certain class of meteors which exhibit themselves as globular masses of light moving with great velocity, and not infrequently passing unbroken across the sky until lost in the horizon. They differ from ordinary meteors, probably, more in volume and brilliancy than in any other distinctive characteristic. They are not to be confounded with another class of meteors that explode in their passage, and appear to let fall a dull red body (meteorolite) to the earth.

Fire-balloon, a balloon which is supplied with heated air from a fire beneath the mouth of the bag, and rises in consequence. Also a small balloon sent up at night with fireworks, and kindling when a certain height is reached.

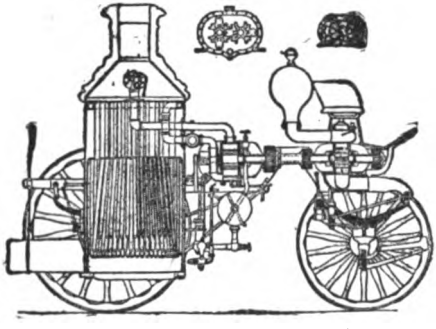
Fireboat, a small steamboat equipped with fire-extinguishing apparatus, and used when a fire breaks out on wharves or in shipping.

Firebox, the box (generally made of copper) in which the fire in a locomotive engine is placed. See *Boiler.*

Fireclay, a compact kind of clay, consisting chiefly of silica and alumina, with a small percentage of iron oxide, capable of sustaining intense heat, and used in making fire-bricks, gas-retorts, crucibles, etc. Fireclay belongs to the coal formation, and is interstratified with coal and other rocks. In the United States the supply of fireclays is chiefly from New Jersey, Missouri, Pennsylvania and Ohio.

Fire-damp, the gas contained in coal, often given off by it in large quantities and exploding, on ignition, when mixed with atmospheric air. Explosion takes place when, as is often the case, the coal consists largely of marsh-gas (light carbureted hydrogen). The composition of the gas evolved from coal is variable, but in connection with the marsh-gas, oxygen, carbonic acid and nitrogen are always present. Fire-damp is a source of great danger to life in coal mines.

Fire-engine, an engine designed to throw a continuous stream of water through a hose upon a conflagration, for the purpose of extinguishing it. Fire-engines are of three principal kinds: hand-power, steam and chemical. Hand-power engines, consisting in the main of a pair of single-acting force-pumps, mounted on wheels and worked by hand, have been generally superseded by steam fire-engines, consisting of a pair of single-acting suction and force-pumps operated by steam. Chemical fire-extinguishers are of various kinds, but mainly depend on the rapid production of carbonic acid gas, which is mixed with water.



Vertical Section of Platform-spring Steam Fire-engine.

The most powerful land steam engine, with a boiler steam pressure of 160 pounds per square inch, can develop a pump pressure of 300 pounds per square inch, and is rated to discharge 1100 gallons of water per minute for fire service.

The practice is to lay 3-inch hose close in to the fire, and finish out with 2½-inch hose as being more expeditiously and safely handled. Each of these streams should be handled by not less than four men. While in the house the water in the boiler is kept continuously at a steam pressure of 20 pounds to the square inch by a stationary water-heating apparatus, so that the engines are ready to pump water whenever they leave the engine house. Horse-drawn fire engines have three horses, as do the hook and ladder trucks.

Motor propelled and operated fire apparatus have been greatly improved in recent years. The types are numerous. Among them are the ordinary steam fire engine, the front wheels and axle of which have been removed and a short four wheel chassis substituted, making it a six-wheeler, the motor simply replacing the horses, and the pumps being operated by steam from the boilers, as formerly.

The chemical fire engine is a valuable adjunct to fire department equipment, and nearly every fire department in the country has one or more chemical outfits. The one most generally used is known as the 'combination wagon,' and carries one or more chemical tanks and a complement of hose, ladders and other light fire appliances. The cities of Baltimore, Detroit, Los Angeles, Philadelphia, St. Louis and Washington operate a considerable number of chemical outfits, specializing gas-impregnated water for small enclosed fires, the practice being to lay in the chemical hose and water first, following them up, if necessary with a larger hose and water, or to save 'water damage' to use the small hose for hydrant or engine stream when the chemicalized water has been exhausted.

'Chemicals' are extensively used in sections where water is not available.

Fire-escape, a contrivance for enabling persons to escape from the upper part of a building which is on fire. It is composed of an arrangement of long ladders. A net is used for lowering people unable

to descend the ladder. Other kinds of fire-escapes are cords coiled in a sleeping apartment, which may be attached to a window; ropes with weights at one end, which may be thrown into windows; poles with baskets attached, and other devices usually. In American cities fire-escapes consisting of iron stairways or ladders are required on all high buildings. The 'Philadelphia fire-escape' is a bricked-in iron stairway, the only entrances to which are on the outside of the building, approached by iron balconies from all floors, with the exit on the street.

Firefly, a name indefinitely given to any winged insect which possesses much luminosity. Except the lantern-fly, the fireflies are all coleopterous, and are members of two nearly allied families, the Elateridæ or skipjacks, and Lampyridæ, to which the glowworm belongs. The British glowworm has too little luminosity to entitle it to the name of firefly, but the *Lampyris Italica*, and *L. corusca* of Canada are allied to it. True fireflies are found only in the warmer regions of the earth. The *Elâter* or *Pyrophorus noctilûcus* of South America and the West Indies is one of the most brilliant, giving out its light from two eye-like tubercles on the thorax. Their light is so powerful that small print may be read by it, and in Hayti they are used to give light for domestic purposes, eight or ten confined in a vial emitting sufficient light to enable a person to write.

Fire-hose. In the United States hose is made of cotton woven into a tube by machinery, two such tubes being fitted within each other and held together by a solution of India rubber, which renders them fireproof.

Fire Insurance, insurance against loss by fire. See *Insurance.*

Firelock, a musket or other gun, with a lock furnished with a flint and steel, by means of which fire is produced in order to discharge it; distinguished from the old matchlock, which was fired with a match.

Firemaking. The oldest method of making fire was by the friction of a stick rubbed in a groove. A later was the fire drill. a stick twirled by a string. A later method was by striking iron and flint together and thus producing sparks. Before the invention of the lucifer match the hearth-fire was kept alive all night. The match was preceded by a phosphorus bottle and other less satisfactory devices.

Fire Ordeal. See *Ordeal*

Fireproofing. Various plans have been adopted for rendering houses or an apartment in a house fireproof, as by constructing them entirely of brick or stone, and employing iron doors, ties and lintels, stone staircases and landings. In the case of textile fabrics, as cotton, linen, etc., saturation with various salts, as borax, is employed, these leaving their crystals in the substance of the fabrics. Wood is best protected by silicate of soda, which, on the application of strong heat, fuses into a glass, and this, enveloping not only the outside but also the internal fibers of the wood, shields it from contact with the oxygen of the air. Fireproof safes are generally constructed with double walls of stout iron, having a space between the walls filled with some substance which is a very bad conductor of heat.

Fire-raising, in Scotch law, is the same as arson in English law. In Scotland it is a capital crime in some cases, but capital punishment is not now inflicted. See *Arson.*

Fireships are generally old vessels filled with combustibles, and fitted with grappling-irons, to hook enemies' ships and set them on fire. This ancient device has been frequently tried in modern warfare, though it can never be of much effect when employed against modern ships.

Fireworks, preparations in various shapes of gunpowder, charcoal, sulphur, saltpeter, filings of iron, etc., used for display at times of public rejoicing, etc. They may be divided into simple hand pieces, such as squibs, crackers, rockets, Roman candles, etc., and arranged 'pieces,' which are contrived with much skill and ingenuity to represent, when ignited, various devices and pictures.

Fire-worship, the worship of fire, the highest type of which worship is seen in the adoration of the sun, not only as the most glorious visible object in the universe, but also as the source of light and heat. In the early religion of India the sun appears in the form of the god Agni (a name akin to Lat. *ignis*, fire), what was first regarded as a mere abstract influence or a phenomenon in time being regarded as a sentient individual. Thus in the Vedic hymns Agni is the god of fire, corresponding to the Greek Hephæstos (Vulcan). In the East the worship of the element of fire was practised by the ancient Persians or Magians, and is continued by the modern Parsees. The establishment of this species of idolatry among the Persians is ascribed to Zoroaster, who taught

his disciples that in the sun and in the sacred fires of their temples God more especially dwelt, and that therefore divine homage was to be paid to these.

Firishta. See *Ferishta.*

Firkin (fėr'kin), an old measure of capacity, being the fourth part of a barrel, or equal to 7½ imperial gallons.—A small cask or keg of indeterminate size.

Firmament, the vault of heaven. The Hebrew word *rakia,* which is so rendered in Scripture, conveys chiefly the idea of expansion, although that of solidity is also suggested, inasmuch as the root signification of the word is that which is expanded by beating out. The English *firmament* is adopted from the Latin *firmamentum,* which is the equivalent of the Greek *stereōma* (*stereos,* firm, solid), by which the writers of the Septuagint rendered *rakia.*

Firman (fėr'man; Per. *fermân*), a decree, order, or grant of an Oriental sovereign, as of Turkey, issued for various special purposes, for instance to ensure a traveler protection and assistance. It differs from a *Hatti Sherif* in so far as it may be signed by any minister, whereas the Hatti Sherif is approved by the Sultan himself with his special mark, and is therefore supposed to be irrevocable.

Firn, the more or less compacted mass of snow which furnishes the material from which glaciers are formed, called also *névé.*

Firolidæ (fir-ol'i-dē), a family of gasteropodous mollusca, belonging to the order Nucleobranchiata or Heteropoda. The members of the typical genus *Firola* are very common in tropical seas and in the Mediterranean, but are so transparent that sometimes they can scarcely be seen. They swim with their foot upwards. They have no shell. The individuals of *Carinaria,* another genus, have a small delicate shell enclosing the gills.

Firozábád (fē-rō-zȧ-bȧd'), a town and municipality in Agra district, Northwestern Provinces of India, headquarters of a tahsil of the same name, 24 miles E. of Agra. It contains numerous ruins of handsome buildings; is a station on the E. Indian Railway, 817 miles from Calcutta. Pop. 16,023. Pop. of tahsil or revenue district, 108,521.

Firozpur (fē-rō̇z-pur'), a thriving commercial town, Punjab, India, capital of a district of the same name. The arsenal is the largest in the Punjab. Pop., including the military cantonments, 2 miles S. of the city, 50,437. The district forms the most southern of the Lahore division. Area, 2752 sq. miles.; pop. 650,519.—Firozpur is also the name of a town in Gurgaon district, Punjab. Pop. 6878.

First-fruits, in the Church of England, the income of every spiritual benefice for the first year, paid originally to the crown, but now to a board, which applies the money so obtained to the supplementing of the incomes of small benefices. See *Annates.*

Firth, Frith, an estuary, a term applied in Scotland to arms of the sea, such as the Firth of Clyde, of Tay, and of Forth, etc. It is the same word as the Norwegian *fiord* (which see).

Fischart (fish'ȧrt), Johann, a German satirist, born between 1545 and 1550; died in 1589. His writings are mostly satirical, partly in prose, partly in verse, partly of both mixed together, and have the most whimsical titles. As a satirist he is the most unrestrained of his age, the papal dignity, and the lives of the priesthood and Jesuits, astrological superstition, scholastic pedantry, etc., being among his favorite subjects of attack.

Fish Commission, established in the United States in 1871 for fostering the fishing industries by distributing food-fishes. It has done admirable work by its study of the locality, food and habits of edible fishes, their propagation, and the distribution of the young in great numbers in suitable waters. It has also made valuable deep-sea explorations. State Fish Commissions are in existence throughout the country.

Fish Culture. See *Pisciculture.*

Fish, Hamilton, an American statesman, born in New York City in 1808; died in 1893. He graduated at Columbia and was admitted to the bar. He was a Whig representative in Congress, 1843–45; a member of the state senate in 1847; and governor of New York, 1849–51. He was a member of the U. S. Senate, 1851–57, and vigorously opposed the Kansas-Nebraska Bill. During the Civil war he threw all his influence on the side of the national administration, and after the war he was secretary of state in Grant's cabinet (1869–77).

Fisher, Sydney George, author, was born at Philadelphia, Pa., in 1856; studied law at Harvard and was admitted to the bar in 1883. His works are historical in character, including *Men, Women and Manners in Colonial*

Times; The Evolution of the Constitution of the United States, etc.

Fisher, JOHN, Bishop of Rochester, was born in 1459, at Beverley, in Yorkshire. He was made chancellor of the University of Cambridge in 1501 and Bishop of Rochester in 1504. He opposed Henry VIII's divorce; listened to the pretended prophecies of Elizabeth Barton, the Maid of Kent; opposed the royal supremacy, and was imprisoned in 1534 and attainted. His appointment as cardinal by Paul III led to his execution after trial by a special commission, 1535.

Fisheries (fish'er-ēs), a term which includes all the industries concerned in the capture of the inhabitants of fresh and salt water for food and other economic purposes. It is thus applied to the procuring not only of fish proper, but also of other animals and products found in the sea, such as sponges, corals, pearls, shellfish, turtles, whales, seals, etc. Fresh-water fisheries include those of salmon, shad, alewives, sturgeons, trout, pike, perch, etc. Sea-fisheries include the herring, cod, haddock, and various other fishes, and are prosecuted in a variety of ways. Of nets the chief varieties are trawls, drift-nets, seines, bagnets, and trammel or set nets, while hand line and long line fishing are widely prosecuted. Fisheries have generally been considered so important an object of national wealth that governments have been careful to protect and encourage them in various ways. The right to various fisheries has often been a matter of international disputes, negotiations, and treaties. Fisheries belonging to particular governments, especially inland fisheries in lakes and rivers, are also frequently protected by laws relating to the mode of capture, etc., which vary with the particular circumstances in each case.

The countries whose fishing industries yield the most valuable results are the United States, Great Britain, Japan, Canada, Norway, France, and Russia. The United States surpasses all other countries in value of fisheries, having annual returns worth over $75,000,000, or $90,000,000 if the island possessions be included. The yield of Great Britain is valued at about $50,000,000, of Japan at $65,000,000, of Russia at $30,000,000, of Canada at $35,000,000, of other countries at over $200,000,000, the world's total being about $500,000,000.

The banks of Newfoundland are one of the richest fishing grounds in the world, and are largely frequented by French fishermen. The German Ocean also yields an exceedingly rich harvest, especially in herring, cod, haddock, flatfish, etc.

Fishery Question, the Canadian. Under the treaty of 1783, at the close of the Revolutionary War, the fishing banks, coasts, bays, and creeks of Canada were thrown open to the fishermen of the United States, but since the close of the War of 1812 these fisheries have been a source of continued controversy. The British Peace Commissioners in 1814 held that the second war had destroyed the first treaty, while the Americans maintained that the rights granted by it could not be revoked. An attempt was made in 1878 to settle the dispute by granting American fishermen the right to fish outside the limit of three marine miles from the Canadian coast. The question of the right to fish in the Gulf of St. Lawrence and the large Canadian bays remained a matter of dispute until 1871, when by treaty the fisheries of each country were thrown open to the others. But as the right to fish in American waters was of no use to Britain, that country claimed damages for the right to fish in Newfoundland and inshore waters for twelve years, the limit of the treaty. Arbitration followed and the sum of $5,500,000 was awarded. In 1888, on the expiration of this treaty, another was negotiated, but the United States Senate refused to ratify it, and the question continued open. The constant old controversy was in the end submitted to The Hague Court for arbitration and a decision was rendered in 1910, with which both nations professed to be satisfied, the United States winning on five of the points in question, Great Britain on the two most important ones.

The points gained by the United States gave fishermen the right to employ foreign crews in their boats, to exercise the same commercial privileges (such as the purchase of boat and supplies) as are accorded to trading vessels generally, to exercise the same privileges on the coast of Newfoundland as in Labrador, and to be exempt from light, harbor, and other duties imposed on Labrador. Those gained by Great Britain were the following: In measuring the three miles from the coast within which fishing was prohibited, it was decided that in the case of large bays the base line should be drawn from headland to headland across the bay, instead of following the sinuosities of the coast. The second point gave Great Britain the right to make reasonable regulations for fishing in Canadian waters. But it was decided that in case such regulations should be disputed as

unreasonable the disputed point or points were to be settled by arbitration. On the whole, both countries declared themselves satisfied with the decision, and a fruitful source of disaffection between the two nations was removed.

Fish-hook, a curved, barbed, and pointed steel wire used for catching fish. The Limerick hook, which has the greatest reputation, has a barb that is forged solid, and then filed into the proper shape, while ordinary hooks have a barb that is raised by cutting into the wire. Hookmaking machines are now common, especially in the United States.

Fish-joint, a spice or joining, as in railways, where two rails end to end are fastened together by flat pieces of iron (*fishplates*) placed on each side of the rails, and fastened by screw-nuts and bolts (*fishbolts*).

Fish-louse, a general name for those of the *Copepoda* which are parasitic upon fish. The name is also applied to certain of the *Isopoda* which have the same parisitic habit.

Fisk, CLINTON BOWEN, soldier and official, was born at Griggsville, New York, in 1828; died in 1890. He engaged in the Civil war, enlisting as a private, and rising to the rank of brevet-brigadier-general of volunteers. After the war he held positions in the Freedman's Bureau and in other service, in 1886 was the candidate of the Prohibition party for governor of New Jersey, and in 1888 for president of the United States. He was one of the founders of Fisk University, Tennessee.

Fiske (fisk), JOHN, author, was born at Hartford, Connecticut, in 1842; died in 1901. He became a lecturer on philosophy at Harvard and subsequently assistant librarian. He published *Myths and Mythmakers*, *Outlines of Cosmic Philosophy*, *The Destiny of Man*, and other philosophic works, and subsequently produced a series of books on American history, including *The Critical Period of American History*, *American Political Ideals*, etc. He was very popular in both these fields of literature.

Fiske, MINNIE MADDERN, an American actress, born in New Orleans, Louisiana, in 1865; made her first appearance on the stage at the age of three and at fifteen became a star. In 1890 she married Harrison Grey Fiske, editor of the *Dramatic Mirror*. She has starred in various plays with signal success, one of the favorites being *Becky Sharp*.

Fission (fish'un), in physiology, reproduction by division of one animal of low type into two, each of these, again, dividing into two others, and so on. The products of the division of the body of the primitive organism may either remain undetached, when they will give rise to a composite structure (as in many corals), or they may be thrown off and live an independent existence. The bacteria that cause disease are regarded as fission fungi.

Fissirostres (fis-i-ros'trēz), a tribe of the Insessores or perching birds, distinguished by having a very wide gape, extending beneath the eyes.

FISSIROSTRES.

1, Diurna. Head, foot, and bill of a swallow. 2, Nocturne. Head, foot, and bill of a goatsucker.

It comprehends the night-jars or goat-suckers, whip-poor-will, swallows, swifts, martins, etc. But in modern classification this division is often disregarded.

Fissurellidæ (fis-ū-rel'i-dē), the key-hole limpets, a family of gasteropodous molluscs resembling the limpets in appearance and habits, but differing considerably in structure. The animal is generally too large for the shell, so that in the typical genus *Fissurella* the shell appears as if it were rudimentary. The species are widely distributed; many are British, and many fossil.

Fistula (fis'tū-la), in surgery, a channel open at both ends excavated between an internal surface and the skin surface, showing no tendency to heal, and generally arising from abscesses. It occurs most frequently at some outlet of the body, as the urinary passages and anus.

Fistularia (fis-tū-lā'ri-a), a genus of acanthopterygious fishes characterized by the elongation of the facial bones into a long fistula or tube at the extremity of which the mouth opens. A notable species is the tobacco-pipe fish.

Fitch, JOHN, inventor, was born at East Windsor, Connecticut, in 1743; died in 1798. After being captured by Indians in Kentucky about 1780, and exchanged, he devoted himself to the application of steam to navigation, producing a model of a steamboat in

1785. A boat made by him came on the Delaware in 1787 with some success, and a boat completed in 1790 made regular trips on the Delaware for some time. He gained no profit from his invention and died in poverty. His boats were moved by paddles, instead of by wheels, as in Fulton's invention. In 1817 a committee of the New York Legislature decided that he was the inventor of the steamboat.

Fitchburg (fitch'burg), one of the county seats of Worcester County, Massachusetts, on the Nashua River, 50 miles N. W. of Boston; on the B. and M. and N. Y., N. H. and H. R. R. It has manufactures of wooden toys, files, paper, cotton, and woolen goods, machinery and engines. Pop. 41,700.

Fitchet (fich'et), or FITCH, the fur of the polecat. It is a yellow ground, with long, soft, black shining hairs on its surface, which are exclusively used for artists brushes. The fur is not in great request as it emits an unpleasant odor which is difficult to dissipate. See *Polecat.*

Fitz, the old French word for *fils,* son; used as a prefix in certain surnames, as *Fitz*gerald, *Fitz*herbert, *Fitz*maurice, *Fitz*william, especially in the surnames of the illegitimate sons of kings or princes of the blood, etc.; as, *Fitz*roy, *Fitz*clarence.

Fitzgerald (fits-jer'ald), FAMILY OF, an Irish family descended from William, Castellan of Windsor in William the Conqueror's reign. Two branches of this house, the Earls of Desmond and Kildare, were for long the practical rulers of the English part of Ireland. The Kildare branch is still represented by the ducal house of Leinster.

Fitzgerald, LORD EDWARD, born near Dublin 1773; died 1798. He was a younger son of the Duke of Leinster, and married Pamela, the reputed daughter of the Duke of Orleans (Egalité) and Madame de Genlis. In 1796 he joined the United Irishmen, and plotted for a French invasion of Ireland; was betrayed by a spy, and arrested. He stabbed two of the officers sent to take him, but was disabled by a pistol-shot, which caused his death before he could be brought to trial.

Fitzgerald, LORD THOMAS, known as 'silken Thomas,' born about 1513; died in 1536. He was vice-deputy for his father, the ninth earl of Kildare, on whose arrest by Henry VIII Lord Thomas raised a formidable revolt in Ireland, which was ultimately put down by Skeffington, and Lord Thomas with his five uncles was hanged at Tyburn.

Fitzgerald, a city in Ben Hill County, Georgia, 25 miles N. E. of Tifton. It has iron-works, cotton-seed-oil mills, etc. Pop. 5795.

Fitzpatrick, BENJAMIN, an American statesman, born in Green county, Georgia, in 1802; died in 1869. He practiced law from 1821 to 1829, when his health broke down and he became a farmer. He was governor of Alabama, 1841–45, and U. S. Senator, 1848–49 and 1853–61, resigning when Alabama seceded and taking an important part in the war. At its close he was chosen president of a convention called to frame a new constitution.

Fitzpatrick, SIR CHARLES, a Canadian politician, born in Quebec, December 19, 1853; was graduated at Laval University and admitted to the bar in 1876. He was a member of the Quebec Assembly, 1890–96, as a Liberal; was then elected to the Dominion Parliament and was appointed solicitor-general in Sir Wilfrid Laurier's ministry. He was minister of justices, 1901-06, and in 1906 became chief-justice of Canada and deputy governor-general.

Fitzroy (fitz-roi'), ROBERT, an English admiral and meteorologist, born in 1805; died by his own hand in 1865. He entered the navy in 1819; from 1828 to 1836 was employed in hydrographical surveys; and was governor of New Zealand, 1843–45. He published *Narrative of the Surveying Voyages of the Adventure and Beagle,* 1839. In 1857 he was promoted to the rank of rear-admiral; in 1863 to that of vice-admiral.

Fiume (fē-ō'mă), a seaport town of Austro-Hungary, and a free town of the Hungarian kingdom, picturesquely situated on the Gulf of Quarnero, in the N. E. extremity of the Adriatic. It has some good streets and buildings (including a cathedral), and its industries embrace paper, tobacco, machinery, chemicals, petroleum, etc. Pop. 49,806.

Five Forks, BATTLE OF, a battle fought on April 1, 1865, at Five Forks, Va., between a Federal force of 25,000 under General Sheridan and an inferior Confederate force under General Pickett. It settled the fate of Petersburg, which was evacuated by the Confederates on April 3, and placed General Grant in possession of the Southside Railroad. The Federal loss was less than 1000; that of the Confederates probably about 8000.

Fixed Alkalies, potash, soda, lithia, and oxides of the rare metals rubidium and cæsium,

so named in contradistinction to ammonia, which is termed volatile alkali.

Fixed Oils. See *Oils.*

Fixed Stars, those stars which appear to remain always at the same distance from each other and in the same relative position. The name comprehends, therefore, all the heavenly bodies, with the exception of the planets, with their moons, and the comets. See *Stars.*

Fixtures (fiks'tūrs), in law, are accessories annexed to houses or lands, which by the fact of their being so annexed become a part of the real property and pass to the freeholder, not being removable at will by the tenant or occupier of the property. The general rule of law is that whatever has been affixed to the premises or put into the land by a tenant during his occupancy cannot be removed without the landlord's consent. Large exceptions are made to this rule in favor of the tenant, covering generally fixtures for trade, for agricultural purposes, and for ornament or convenience; but the removal must not injure the land or buildings of the landlord.

Flag, a piece of cloth on which certain figures or devices are painted, impressed, or wrought, borne on a staff or pole, and usually employed to distinguish one company, party, or nationality from another. In the army a flag is a banner by which one regiment is distinguished from another. Flags borne on the masts of vessels not only designate the country to which they belong, but also are made to denote the quality of the officer by whom a ship is commanded. In the United States Navy distinctive blue flags with four, three, and two white stars, are worn at the main, fore, and mizzen by admirals, vice-admirals, and rear-admirals, respectively. Commodores have a broad blue pennant, with one white star, which is worn at the main when the commodore is acting as commander-in-chief. Any officer commanding a vessel, except one on board of which a flag or broad pennant may be worn, shall wear a narrow pennant at the main. When powder is being taken on board a red flag is hoisted at the fore. A yellow flag is the quarantine flag. Flags of truce are white, and on water are met by a boat or vessel from the senior officer's vessel in charge of a commissioned officer, having a white flag. To lower or *strike* the flag is to pull it down, or take it in, out of respect or submission to superiors. To lower or strike the flag in an engagement is a sign of yielding. A sign of mourning is to hoist the flags at a half or two-thirds of the height of the masts; if on land, at half the height of the staff. Besides the use of flags as distinguishing emblems, a very important use of them at sea, both by national and mercantile navies, is as signals according to an arranged code. See *Flag of the United States.*

Flag, a popular name for many endogenous plants with sword-shaped leaves, mostly growing in moist situations; but sometimes particularly appropriated to *Iris Pseudacōrus*, nat. order Iridaceæ; also termed *Flower de lis* or *Flower de luce.* It has sword-shaped leaves and yellow flowers, grows in marshy places and by the sides of streams and lakes. The stout creeping root-stock has been recommended for alleviating the toothache, and is used for dying black in the Hebrides. The leaves make excellent thatch, and are also employed for making bottoms to chairs.

Flagellants (flaj'el-ants; Latin *flagellare*, to lash or scourge), the name of a sect in the thirteenth century who maintained that flagellation was of equal virtue with baptism and other sacraments. They walked in procession with shoulders bare, and whipped themselves till the blood ran down their bodies, to obtain the mercy of God and appease His wrath against the vices of the age. Rainer, a hermit of Perugia, is said to have been its founder in 1260. He soon found followers in nearly all parts of Italy. Their number in time amounted to 10,000, who went about, led by priests bearing banners and crosses. They went in thousands from country to country, begging alms. For centuries they formed a sort of intermittent order of fanatics, frequently reappearing here and there in times of extraordinary declension or distress.

Flageolet (flaj'e-let), a small wind-instrument of music, played by means of a mouthpiece. The tone produced is similar to that of the piccolo, but is softer in quality, and the range is two octaves. The double flageolet consists of two instruments united by one mouthpiece, and producing double notes. The name *flageolet tones* is given to those harmonic tones on the violin, violoncello, and other stringed instruments produced by the finger lightly touching the string on the exact part which generates the harmony, and not by pressing the string down to the fingerboard.

Flag-officer, in the navy, a general distinguishing title for an admiral, vice-admiral, and rear-ad-

miral, who have the right to carry flags indicating their rank at the mast-head.

Flag of the Prophet, the *Sanjak-sherif*, or sacred flag of the Mohammedans. It was originally composed of the turban of the Koreish captured by Mohammed; but the black curtain that hung in front of the door of Ayesha, one of Mohammed's wives, was afterwards substituted. It is preserved in the seraglio at Constantinople. The carefully-guarded banner unfolded at the commencement of a war is not the real sacred flag, though it is commonly believed to be so.

Flag of the United States. Previous to the adoption of a nation flag by Congress, several flags of different patterns were used in the course of the period of stress which culminated in the Revolution. One of these bore the device of a rattlesnake, the suggestion of which appeared as early as 1751, when it was shown in Franklin's '*Pennsylvania Gazette*'; three years later, in the form of a severed snake whose parts were identified by the initials of the thirteen colonies, with the motto, 'Unite or die!' it was used to urge union of the colonies to resist the French and Indian invasion. Later the rattlesnake became a suggestive emblem of the colonies and was used by newspapers to express the spirit of the colonies in relation to the mother country. The '*Pennsylvania Journal*' incorporated it in its heading in 1775. John Paul Jones is said to have been the first to hoist an American flag on an American vessel, in December, 1775, when he was serving as first lieutenant on the 'Alfred' in Philadelphia. This ensign was of the rattlesnake design, but according to Sherburne in his '*Life of Paul Jones*' the snake was not coiled but 'running,' and that the field consisted of 13 red and blue stripes; other authorities claim that the device was a pine tree with the snake coiled about its roots. Still another claim is that the first American flag was hoisted on the 'Black Prince,' on December 3, 1775. When the first national fleet of regularly commissioned ships sailed down the Delaware in December, 1775, Barry got free of the Capes in the 'Lexington,' but the other vessels were caught in the ice and did not get clear for some weeks, by which time the fleet all carried the Union Flag. It was in this year that Abram Markoe, organizer and then captain of the 'City Troop,' Philadelphia's famous mounted body, designed and presented to the troop a flag that is of the greatest interest as being the first that bore the thirteen stripes symbolizing the thirteen colonies that were then asserting their rights in relation to the mother country. In this year also, April 23, Connecticut had a flag bearing as device the arms of the colony and the motto '*Qui transtulit sustinet*'; Putnam, on July 18, 1775, unfurled a flag with a red ground bearing the motto of Connecticut on one side and on the reverse 'An Appeal to Heaven.' Moultrie, on James Island, South Carolina, hoisted a blue flag, with a crescent in the corner for the Union. The same autumn the Philadelphia floating-batteries carried a white flag, a tree in the field and the motto 'An Appeal to Heaven.' In February, 1776, the flag of the commander-in-chief of the American Navy was presented to the South Carolina Congress by Christopher Gadsden; it had a yellow field, with a lively representation of a rattlesnake in the middle in the attitude of going to strike and the words underneath: 'Don't tread on me!' The Provincial Congress of Massachusetts voted on April 29, 1776, that the flag of the cruisers of that colony should be white with a green pine tree and bearing an inscription 'An Appeal to Heaven.'

On January 2, 1776, the Great Union Flag was unfurled at Washington's camp on Prospect Hill, Cambridge, Massachusetts. In it the solid red of the British flag was replaced by thirteen stripes with the Union of the British Union Jack. This flag was generally used until the new national flag, itself a modification of the Great Union Flag, was adopted a year and a half later.

On June 14, 1777, Congress by a resolution outlined the design of the National flag 'to be thirteen stripes alternate red and white; that the Union be thirteen stars, white in a blue field, representing the new constellation.' This flag was first used by General Gates. When the victorious Americans marched General Burgoyne's soldiers off the field on his surrendering, on October 17, 1777, they 'proudly unfurled their new flag.' The stars and stripes were also probably at Brandywine and Germantown, but certainly they flew at Valley Forge. On the admission of Vermont and Kentucky in 1791, two stripes and two stars were added, and in 1794 Congress decreed that after May 1, 1795, 'the flag of the United States be fifteen stripes alternate red and white and that the Union be fifteen stars white on a blue field.' It was intended that a new stripe and a new star should be added to the flag for each new State admitted to the Union, but it became apparent that if this plan were carried out the flag would grow too large, consequently Congress resolved, on April 4.

1818, that the number of stripes should be reduced to the original number of thirteen, representing the colonies, and that only a star should be added to the field on the admission of a new State. This design was made by Samuel Chester Reid, a naval officer, of New York, who invented the signal telegraph at the Battery and the Narrows. Since that time twenty-eight new stars have been added to the flag, which now bears thirteen stripes and forty-eight stars.

Tradition credits the making of the first 'Stars and Stripes' to Mrs. Elizabeth Ross, in a house later known as No. 80 Arch Street, Philadelphia, and many patriotic and romantic stories have been published relating thereto. It would seem that the claim made in Betsy Ross' favor is not without meeting historical support.

It is interesting to note that the first man to carry the American flag around the world was Robert Gray, the discoverer of the Columbia River. He flew it on the 'Columbia' in her voyage lasting from September 30, 1787, till 1790.

Flagship, a ship in which an admiral, or the commander of a squadron, hoists his flag.

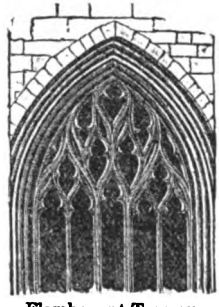
Flahaut de la Billarderie (flä-ō de là bē-yär-drē), AUGUSTE CHARLES JOSEPH, COMTE DE, French general and diplomatist, born 1785; died 1870. He had a brilliant career under Napoleon I, but on the return of the Bourbons he left France and lived in exile from 1815 to 1830. He married in England the daughter of Admiral Keith, who became Baroness Keith in 1823. He returned to France in 1830, and was ambassador successively at Berlin, Vienna, and London.

Flambard (flam'bard), RALPH, a Norman of humble origin who became the chief minister of William Rufus. His flagrant extortions earned the hatred of the people, and his character is painted in the blackest colors by the chroniclers. He was made Bishop of Durham; but on the death of William he was committed to the Tower, from whence he escaped, and instigated Robert, Duke of Normandy, to invade England. He was subsequently restored to Durham, where he lived peaceably till his death in 1128.

Flambeau (flam'bō), a sort of torch or light made of thick wicks covered with wax or other inflammable material, and used at night in illuminations, processions, etc.

Flamborough Head (flam'bur-ō), a headland on the east coast of England in Yorkshire. It consists of a lofty range of chalk cliffs about 6 miles long and from 300 to 450 feet high. On the extreme point of the promontory, at a height of 214 feet above sea-level, is a lighthouse 87 feet high, with a revolving light visible from a distance of 20 miles.

Flamboyant (flam-boi'ant), a style of Gothic architecture in use in France about the same period with the Perpendicular style in England, that is from the 14th to the 16th century. It was distinguished by the waving and somewhat flame-like tracery of the windows, panels, etc., and is usually regarded as a decadent variety of the decorated Gothic. The moldings in this style are often ill combined. The pillars are often cylindrical, either plain or with a few of the more prominent moldings of the arches continued down them, without any capital or impost intervening. The arches are usually two-centered, sometimes semicircular, and, in later examples, elliptical.



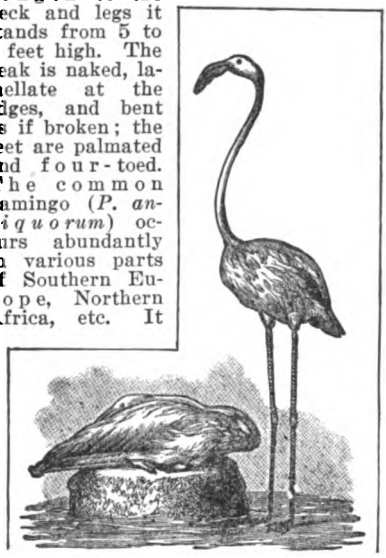
Flamboyant Tracery, St. Ouen, Rouen.

Flame (flām), a blaze rising from a burning body, or any inflammable gas in a state of visible combustion. Flame is attended with great heat, and sometimes with the evolution of much light; but the temperature may be intense when the light is feeble, as is the case with the flame of burning hydrogen gas. The flame of a candle may be divided into three zones: an inner zone containing chiefly unburned gas, another zone containing partially-burned gas, and an outer zone where the gas is completely consumed by combination with the oxygen of the air. The luminosity of flame depends upon the presence of extremely small particles of solid matter (usually carbon) or of dense gaseous products of combustion. When the pressure of the gas producing the flame is so great that it is all but flaring, it is found that certain sounds will cause the flame to alter its shape, thus producing *sensitive flames.*

Flamen (flā'men), among the ancient Romans the name given to any priest devoted to the service of one particular deity. Originally there were three priests so called: the *Flamen Diālis,* consecrated to Jupiter; *Flamen Martiālis,*

sacred to Mars; and *Flamen Quirinālis*, who superintended the rites of Quirinus or Romulus; but the number was ultimately increased to fifteen, the original three, however, retaining priority in point of rank, being styled *Majŏres*, and elected from among the patricians, while the other twelve, called *Minŏres*, were elected from the plebians.

Flamingo (fla-min'go), a bird of the genus *Phœnicoptĕrus*, formerly placed in the order of wading birds, but now generally ranked among the Natatores or swimmers, and constituting a family Phœnicopteridæ, allied to the Anatidæ or ducks. Its body is smaller than that of the stork, but owing to the great length of the neck and legs it stands from 5 to 6 feet high. The beak is naked, lamellate at the edges, and bent as if broken; the feet are palmated and four-toed. The common flamingo (*P. antiquorum*) occurs abundantly in various parts of Southern Europe, Northern Africa, etc. It



Flamingo, with Female on nest.

is entirely scarlet, except the quill feathers, which are jet-black. The tongue is fleshy, and one of the extravagances of the Romans during the later period of the empire was to have dishes composed solely of flamingoes' tongues. The flamingoes live and migrate in large flocks, frequenting desert sea-coasts and salt-marshes. They are extremely shy and watchful. While feeding they keep together, drawn up artificially in lines, which at a distance resemble those of an army; and, like many other gregarious birds, they employ some to act as sentinels, for the security of the rest. Their food appears to be mollusca, spawn, crustaceans, etc., which they fish up by means of their long neck, turning their head in such a manner as to take advantage of the crook in their beak. They breed in companies in inundated marshes, raising the nest to a certain height by heaping up the mud with their feet into a small hillock, which is concave at the top. In this the female lays her eggs, and it was formerly believed that she sat on them with her legs hanging down, like those of a man on horseback. But the nests are not so high as to allow of this, and the birds really sit with their legs doubled up under them. An American species of flamingo is *P. ruber*.

Flaminian Way (flam-in'i-an), the principal northern road which led from ancient Rome. It was constructed by C. Flaminius the Elder in 220 B.C. during his censorship, and led from Rome to Ariminum (Rimini) on the Adriatic, 222 miles. Remains of it are yet extant in various places.

Flamininus (flam-in-ī'nus), TITUS QUINTIUS, a Roman general, born about 230 B.C.; died about 174. He was quæstor in 199, consul in 198, terminated the Macedonian war by the defeat of Philip at Cynoscephalæ 197, and proclaimed at the Isthmian games in 196 the independence of Greece.

Flaminius (flâ-min'i-us), CAIUS, a Roman general, was tribune in 232 B.C., prætor in 227, consul in 223, censor in 220, and again consul in 217. He had a triumph for defeating the Insubrian Gauls; and during his second consulship he constructed the Flaminian Way and built a circus. In 217 he was sent against Hannibal into Etruria, and was defeated and killed in the battle of Lake Thrasymenus (23d June).

Flammarion (flâ-mâ-re-ōn), CAMILLE, author, born at Montigny-le-Roi, France, in 1842. He studied divinity, was a pupil at the Astronomical Observatory of Paris, 1858-62, and formed the Astronomical Society of France in 1887. His works are popular in character. They include *The Atmosphere*, *The Planet Mars*, *Popular Astronomy*, *Lumus*, etc. He became an earnest investigator of spiritualism and wrote several works favoring that subject.

Flamsteed (flam'stēd), JOHN, the first astronomer-royal of England, was born in 1646. He was graduated at Cambridge in 1674, took orders in the church, but devoted himself chiefly to mathematical and astronomical pursuits. He was appointed by Charles II astronomical observator to

the king, and carried on his observations at the Queen's House at Greenwich, until the observatory was built for him in 1676. Here he passed his life; formed the first trustworthy catalogue of fixed stars; and supplied the lunar observations by means of which Newton verified his lunar theory. He died in 1719. His great work, *Historia Cœlestis*, was published in 1725. In 1832 the discovery of a collection of his letters disclosed a protracted quarrel between him and Newton.

Flanders (flan'ders), a region of Europe, now included in Holland, Belgium, and France, stretching along the German Ocean. The erection of the territory into a county took place in the 9th century, and was made by Philip the Bold, king of France, in favor of his son-in-law, Baldwin. It afterwards passed to the united houses of Spain and Austria, and ultimately to the latter, but underwent considerable curtailment by the conquests of the French in the west, when part of it became French Flanders, and by the conquests of the Dutch in the north. The remainder still retains its ancient name, and forms the modern provinces of East and West Flanders, in Belgium.—The Belgian province of EAST FLANDERS (French *Flandre Orientale*) has an area of 1157 square miles. The surface forms an extensive plain, sloping gently eastwards. It wholly belongs to the basin of the Schelde. Its soil, partly of a sandy and partly of a clayey nature, is so industriously and skillfully cultivated that it has the appearance of a vast garden. The principal crops are wheat and flax. Linen, laces, and damask are among the important manufactures. Gand or Ghent is the capital.—WEST FLANDERS (French, *Flandre Occidentale*) has an area of 1248 square miles. The surface is generally flat; the soil naturally sandy and poor, but well cultivated and fertilized, though not so productive as that of East Flanders. The most important branch of industry is linen. Great quantities of lace also are made. Bruges is the capital.

Flange (flanj), a projecting edge, rim, or rib on any object, as the rims by which cast-iron pipes are connected together, or the projecting pieces on the tires of the wheels of railway-carriages to keep them on the rails.

Flank, in fortification, that part of a work which affords a lateral defense to another. In military tactics flank signifies the outer extremity of the wing of an army, or of any division of an army, as of a brigade, regiment, or battalion.

Flannel (flan'el), a woolen fabric of loose texture and various degrees of fineness, much used as a clothing both in hot and cold countries from its properties of promoting insensible perspiration, which is absorbed and carried off by the atmosphere. Welsh flannels have attained a high reputation. In flannel shirtings the wool is frequently mixed with silk, linen, and cotton.

Flat, a character or sign in music, used to lower or depress, by the degree of a semitone, any note in the natural scale. It is marked thus ♭. An *accidental flat* is one which does not occur in the signature, and which affects only the bar in which it is placed.

Flat-fish, a fish which has its body of a flattened form, swims on the side, and has both eyes on the side which is uppermost in swimming, as the flounder, turbot, halibut, and sole. The word is sometimes extended to other fishes which have the body much compressed, as the skate and other members of the ray family.

Flathead Indians, tribes established in the State of Washington, mainly of the now nearly extinct Chinook group of fish-eating Indians. They flatten the skull of the infant by some mechanical pressure during the first six or eight months of life. The same custom anciently prevailed among many tribes, but the practice is now nearly extinct. The name Flathead is improperly given to the small civilized tribe of Selish Indians.

Flat River, a city in St. François County, Missouri. In a lead-mining section. Pop. 5112.

Flaubert (flō-bār), GUSTAVE, novelist, born at Rouen, France, in 1821; died in 1880. His first (unsuccessful) writings were poems, but his *Madame de Bovary*, a realistic novel, had wonderful success. Other works were *Salammbo*, *Trois Contes*, etc. He was a deliberate stylist, believing that the greatest writer was he who became the most perfect instrument for receiving impressions from external things and rendering them in accurate language.

Flavel (flav'el), JOHN, noncomformist divine, born in Worcestershire, England, in 1627; died at Exeter, 1691. He was curate at Deptford and Dartmouth, but was ejected under the Act of Uniformity, when he continued to preach privately.

Flavine (flav'ēn; Lat. *flavus*, yellow), a yellow dye-stuff identical with quercitrin, and used as a substitute for quercitron bark. It gives a fine olive-yellow color to cloth.

Flax (flaks), the common name of the plants of the genus *Linum*, nat. order Linaceæ. The species, of which there are nearly a hundred, are herbs or small shrubs, with narrow leaves, and yellow, blue, or even white flowers arranged in variously-formed cymes. They occur in warm and temperate regions over the world. The cultivated species is *L. usitatissimum*. The

Flax (*Linum usitatissimum*).

fiber, which is used for making thread and cloth called linen, cambric, lawn, lace, etc., consists of the woody bundles of the slender stalks. The fine fibers may be so separated as to be spun into threads as fine as silk. A most useful oil is expressed from the seeds, and the residue, called linseed-cake, is one of the most fattening kinds of food for cattle. When the plant is ripe it is pulled up by the roots, tied in little bundles, and usually left upright on the field till it becomes dry, when the seeds are separated, either by beating on a cloth or by passing the stems through an iron comb. The process of removing the seeds is called *rippling*. The stalks are then *retted* or rotted in water to free the flaxed fiber from the wooden core or *boon* of the stem. Two operations are necessary to separate the fibers from the woody part of the stem. The flax is first *broken* by means of a wooden handle and grooved board, or by revolving grooved rollers, and then the *boon* or woody part is entirely separated from the fiber by a broad, flat, wooden blade called a *scutching blade*, or by a machine in which a number of knives attached to the arms of a vertical wheel strike the flax in the direction of its length, and completely separate it. The flax is next *heckled*, or combed with a sort of iron comb, beginning with the coarser and ending with the finer, and is now ready for spinning. See *Linen*.

Flax, New Zealand, a fiber obtained from a plant belonging to the order Liliaceæ, the *Phormium tenax*. It is indigenous in New Zealand and Norfolk Island, and grows in great tufts with sword-shaped leaves sometimes 6 feet long. The long spike, bearing a large number of yellow flowers, rises from the center of the leaves. The thick, leathery leaves contain a large quantity of good strong fiber, which is used by the natives of New Zealand for making cloth, nets, etc., and would be very valuable in commerce but for the gummy matter in the leaves which it is difficult to get rid of. It has been introduced into European culture.

Flaxman (flaks'man), John, one of the most distinguished English sculptors, born at York, 1755; died in London, 1826. His earliest notions of art were derived from casts in the shop of his father, who sold plaster figures, from many of which young Flaxman made models in clay. In 1770 he was admitted a student of the Royal Academy, and for some time earned a living by producing the designs for Wedgwood, the potter. In 1787 he went to Italy, where he remained seven years, and left many memorials of his genius,

John Flaxman.

besides executing designs in outline to illustrate Homer, Dante, and Æschylus, an extensive series for each. In 1794 he returned to England, where he was diligently occupied with his professional pursuits until his death. He had been elected an associate of the Royal Academy in 1797, royal academician in 1800, and in 1810 was appointed professor of sculpture to that institution. His works

are very numerous, and are to be found all over the country; and a large collection of casts from the original models, etc., is preserved in University College, London.

Flea (flē), a name for several insects regarded by etomologists as constituting a distinct order Aphaniptera,

A, Flea (*Pulex Irritans*). B, Larva of same. C, Pupa of same.

because the wings are inconspicuous scales. All the species of the genus are very similar to the common flea (*Pulex irritans*). It has two eyes and six feet; the feelers are like threads; the oral appendages are modified into piercing stilets and a suctional proboscis. The flea is remarkable for its agility, leaping to a surprising distance, and its bite is very troublesome.

Fleabane (flē'bān), a name popularly given to several composite plants from their supposed power of destroying or driving away fleas, as the species of the genus *Conyza*, which were believed to have this power when suspended in a room. The common fleabane is *Pulicaria dysenterica*, found in moist, sandy places in the south of England, whose smoke was supposed to expel fleas. The blue fleabane is *Erigeron acre*, common on dry banks.

Flea-beetle, the name given to different species of beetles which are destructive to plants. The turnip-flea (*Haltica nemŏrum*), whose larvæ are sometimes so destructive to the turnip crops, furnishes an example.

Flèche (flāsh), La, a town in France, department of Sarthe, on the right bank of the Loir, 25 miles southwest of Le Mans. It contains a military college, occupying part of the extensive buildings of a former college belonging to the Jesuits. Pop. of commune 10,519.

Flecknoe (flek'nō), Richard, an English poet and dramatic writer, said to have been a Roman Catholic priest, contemporary with Dryden, and chiefly memorable for having had his name gibbeted by that satirist in the title of his satire against Shadwell. He died in 1678.

Fleece, Golden. See *Argonauts* and *Jason.*

Fleece, Order of the Golden. See *Golden Fleece.*

Fleet (flēt), a general name given collectively to the ships of a navy; also any number of ships, whether designed for war or commerce, keeping in company.

Fleet Marriages, irregular marriages performed without license by needy clergymen in the Fleet Prison, London, from about 1616 till they were suppressed by the Marriage Act of 1754. These clergymen were ready to marry any couples that came before them for a fee proportioned in amount to the circumstances of those who were married. Sometimes a dram of gin was thought sufficient; at other times the fee was rather exorbitant. Registers of these marriages were kept by the officiating parties, and a collection of these books, purchased by government in 1821, amounted to between 200 and 300 large registers, and upwards of 1000 smaller books. These books were inadmissible as evidence in a court of justice.

Fleet Prison, formerly a celebrated prison in London, till it was pulled down in 1845. It stood on the east side of Farringdon Street, and on this site a prison was in existence as early as the 12th century, which took its name from the creek or stream of the Fleet, on the bank of which it was erected. It was early used as a place of confinement for debtors, and served as such down to the period of its abolition. It was burned by Wat Tyler in 1381, in the Great Fire of 1666, and by the Gordon rioters in 1780. It was the scene of many disgraceful abuses, and was called by Pope the 'Haunt of the Muses,' from the number of poets who were confined in it.

Fleetwood (flēt-wụd), a seaport and watering-place in England, in the county of Lancaster, on the Wyre, near its entrance into Lancaster Bay, 18 miles northwest of Preston. It has a school of musketry and barracks. The harbor is safe and commodious. Pop. (1911) 15,876.

Fleming (flem'ing), John, a Scottish naturalist, born near Linlithgow, in 1785; died at Edinburgh, 1857. He was successively minister of the parish of Bressay, in Shetland; professor of natural philosophy at King's College, Aberdeen, and professor of natural science at the New College, Edinburgh. He wrote a *Report on the Economical Mineralogy of the Orkney*

and Zetland Islands; the *Philosophy of Zoology; British Animals;* and a large number of papers on zoology, palæontology, and geology contributed to the *Encyclopædia Britannica,* the *Edinburgh Encyclopædia,* the *North British Review,* etc.

Flemish Language and Literature. The Flemish or Vlaemisch language is a form of Low German, differing only slightly in pronunciation and orthography from the Dutch. It is spoken by a considerable number of the inhabitants of Belgium, especially in the provinces of East Flanders, West Flanders, Antwerp, Limburg, and Brabant. A fragment of a prose translation of the Psalms upwards of a thousand years old is the oldest extant specimen of the Flemish. The 'father of Flemish poetry,' Jakob Van Maerlaut, wrote several romances dealing with Merlin and the Holy Grail. *The Mirror of History,* etc., in the 13th century; and a version of *Reynard the Fox* belongs to the same period. The 14th century was remarkable for the number of wandering poets, authors of knightly romances. The translation of the Bible, which is considered the standard for the construction and orthography of the language, was finished in 1618. The eighteenth century produced several good writers on philology, but was barren in poetry. The French almost annihilated the native literature, and it did not revive till the revolution of 1830, since which time it has been very vigorous. The leaders in this revival were Willems, Blommaert, Van Ryswyck, Conscience, Van Duyse, Snellaert, Snieders, De Laet, Dedecker, David, and Bormans.

Flemish School OF PAINTING. See *Painting.*

Flensburg (flens'burg), formerly *Flensborg,* a town in Prussia, province of Schleswig-Holstein, at the west end of the fiord of same name, 20 miles N. N. E. of the town of Schleswig. It has important manufactures and is the seat of an active trade, being the most important town in Schleswig. Pop. (1910) 60,922.

Flers (flâr), a town in France, dep. Orne, 37 miles northwest of Alençon. It contains the remains of a fine old castle, has manufactures of linen, bleach-works, etc. Pop. (1906) 11,188.

Flesh, a compound substance forming a large part of an animal, consisting mainly of the muscles, with connective tissue, and the blood-vessels and nerves, etc., supplying them. It consists chiefly of fibrin, with albumen, gelatin, hæmatin, fat, phosphate of sodium, phosphate of potassium, phosphate and carbonate of calcium, sulphate of potassium, and chloride of sodium. The solid part is, besides, permeated by an alkaline fluid, called serum. It has a red color, and contains dissolved a number both of organic and inorganic substances. The organic matter consists of albumen, casein, creatin and creatinin, inosic and several other acids; the inorganic, of alkaline sulphates, chlorides, and phosphates, wth lime, iron, and magnesia.

Fleshfly. See *Blowfly.*

Fleta (flē'ta), a Latin commentary upon English law, said to have been written in the Fleet Prison in the reign of Edward I. It has been attributed to William de Brampton, and also to Thomas de Weyland, J. de Lovetot, and Adam de Strutton.

Fletcher (flech'er), ANDREW, a Scottish political writer, the son of Sir Robert Fletcher, of Saltoun, born in 1653; died at London in 1716. He opposed the court in the Scottish Parliament, and had to retire to Holland. In 1685 he joined the enterprise of the Duke of Monmouth. He afterwards took refuge in Spain and in Hungary, and returned to England at the Revolution. He brought forward measures to secure the religion and liberties of the nation on the death of the queen (Anne), and carried various limitations of the prerogative, forming part of the Act of Security, rendered nugatory by the Scottish union, which he vehemently opposed.

Fletcher, FRANK FRIDAY, admiral of the United States Navy, born at Oskaloosa, Iowa, in 1855, graduated from the Naval Academy in 1875 and was promoted through various grades to rank of admiral in 1915. He was in command of the naval forces which took possession of Vera Cruz in April, 1914, and succeeded Rear-Admiral Badger as commander-in-chief of the North Atlantic Fleet the same year. He was the inventor of the Fletcher breech mechanism and gun mounts.

Fletcher, JOHN, English dramatist, collaborator with Francis Beaumont. See *Beaumont* and *Fletcher.*

Fleur-de-lis (*fleur-dē-lē'*; French, 'flower of the lily'), in heraldry, a bearing as to the origin of which there is much dispute, some authorities maintaining that it represents the lily, others that it represents the head of a lance or some such warlike weapon. The fleur-de-lis has

Fleur-de-lis.

long been the distinctive bearing of the government of France.

Fleurus (fleu-rûs), a town of Belgium, province of Hainaut, 7 miles northeast of Charleroi. In the vicinity, in 1690, the French under Marshal Luxembourg defeated the Germans under Prince Waldeck; and in 1794 the French republican forces under Marshal Jourdan defeated the Austrian army. Pop. about 6000.

Fleury (fleu-rē), ANDRÉ HERCULE DE, cardinal and prime-minister of Louis XV, was born in 1653; died in 1743. In 1698 Louis XIV gave him the bishopric of Fréjus, and shortly before his death appointed him instructor to Louis XV. After the death of the regent in 1723 he proposed the Duc de Bourbon as first minister, but in 1726 he overturned the government which he had himself set up, and from that date kept the direction of affairs in his own hands. In the same year he was made a cardinal. The internal affairs of France prospered under his administration, but his foreign policy was unfortunate.

Fleury, CLAUDE, a French writer, born in 1640; died in 1723. He was educated in the Jesuit College at Clermont, and after beginning to practise as a lawyer resolved to take orders. In 1716 he became confessor to Louis XV. He procured admission into the Academy in 1696 by several important works, among which the best known are his *Histoire du Droit Français, Mœurs des Israélites, Mœurs des Chrétiens, Institution au Droit Ecclésiastique, Histoire Ecclésiastique.*

Flexner, SIMON, American physician, director of laboratories, Rockefeller Institute for Medical Research, was born at Louisville, Ky., 1863, and educated at the universities of Louisville, Strassburg, Prag, and Berlin. He was associate professor of pathology in Johns Hopkins University, 1891-98; professor of pathological anatomy, 1898-99; professor of pathology, University of Pennsylvania, 1899-1903; director Ayer Clinical Laboratory, Pennsylvania Hospital, 1901-03; and Philadelphia Hospital, 1899-1903. He has written many books relating to bacteriological and pathological subjects.

Flinders (flin'derz), MATTHEW, an English navigator, celebrated for his Australian discoveries, born in Lincolnshire 1774; died 1814. He went to Australia in 1795, and discovered Bass Strait in 1798. In 1801 he obtained from the British government the command of an expedition to explore the Australian coasts, in which he spent two years. While returning home he was taken prisoner by the French at Mauritius, and detained till 1810, after which he published his *Voyage to Terra Australis. Flinders Island* (off the N. E. coast of Tasmania) was named after him.

Flint, or FLINTSHIRE, a maritime county in North Wales, area 255 sq. miles, of which three-fourths is under crops or in pasture. The county is rich in minerals, particularly lead, the mines of which are productive. Coal also abounds, and copper is obtained in considerable quantities. Flint returns one member to the House of Commons. Capital, Mold. Pop. 92,720.—The former capital, FLINT, a parliamentary and municipal borough and seaport, is situated on the estuary of the Dee, 13 miles S. W. of Liverpool. In the vicinity are extensive alkali works and several lead and coal mines. There are also large copper works. The shipping trade of the port is small. A little N. E. of the town, on the shore of the estuary, stands the ancient castle of Flint, commenced by Henry II and completed by Edward I. It was the prison of Richard II, and has remained in ruins since 1667. Pop. (1911) 5474.

Flint, a city, county seat of Genesee Co., Michigan, is on the Flint River, 34 miles S. E. of East Saginaw. It has a state institution for the deaf and dumb, an insane asylum, and manufactures of automobiles and automobile parts, carriages, cigars, iron goods, etc. Pop. 42,000.

Flint, a variety of quartz of a yellowish or bluish-gray or grayish-black color. It is amorphous, and usually occurs in nodules or rounded lumps. Its surface is generally uneven, and covered with a whitish rind or crust, the result of weathering or of the action of water percolating through the rocks. It is very hard, strikes fire with steel, and is an ingredient in glass and in all fine pottery ware. The fracture of flint is perfectly conchoidal; though very hard, it breaks easily in every direction, and affords very sharp-edged, splintery fragments, formerly made into arrow-heads, etc. (See *Flint Implements.*) Its true native place is the upper bed of the chalk formation, in which it is formed as a series of concretions, the silica in sponges and in other marine animals which lived on the sea floor while the chalk was being deposited being attracted into nodules in this process.

Flint-glass, a species of glass, so called because pulverized flints were originally employed in its

manufacture. It is extensively used for domestic purposes. Its dispersive power in regard to light renders it invaluable in the manufacture of the object-glasses of telescopes and microscopes, as by combining a concave lens of flint-glass with one or two convex lenses of crown-glass, which possesses a much less dispersive power, a compound lens is formed in which the prismatic colors arising from simple refraction are destroyed, and the lens rendered achromatic. Quartz and fine sand are now substituted for flint in the manufacture of this glass.

Flint Implements, implements of flint used by man while unacquainted with the use of metals. For such implements granite, jade, serpentine, jasper, basalt, and other hard stones were also used, but the most numerous were formed of flint. They consist of arrow-heads, axe-heads, lance-heads, knives, wedges, etc. (See *Celts.*) Flint implements are still used by some savage tribes.

Flintlock, a musket-lock in which fire is produced by a flint striking on the steel pan, formerly in common use, now superseded by locks formed on the percussion principle.

Floating Batteries (flōt'ing), batteries erected either on simple rafts or on the hulls of ships, for the defense of a coast or for the bombardment of an enemy's ports. They were used notably at the siege of Gibraltar (1779-83) and during the Russian war (1854).

Floating Breakwater. See *Breakwater.*

Floating Docks. See *Docks.*

Floating Island, an island formed in a lake or other inland water, consisting generally of a mass of earth held together by interlacing roots. They occur on the Mississippi and other rivers, being portions of the banks detached by the force of the current and carried down the stream, often bearing trees. Sometimes such islands are large enough to serve as pasture grounds. Artificial floating islands have been formed by placing lake mud on rafts of wickerwork covered with reeds. They were formerly used in the waters around Mexico, and may be seen in Persia, India, and on the borders of Tibet. On these the natives raise melons, cucumbers, and other vegetables which need much water.

Floating Quartz, or FLOATSTONE, a porous variety of quartz of a spongy texture, whitish-gray in color, so light as to float in water. It frequently contains a nucleus of common flint.

Flobecq (flō-bek), a town of Belgium, prov. of Hainaut, 20 miles N. E. of Tournai. Pop. 5200.

Flock (flok), the refuse of cotton and wool, or the shearing of woolen goods, etc., used for stuffing mattresses, furniture, etc. *Flock-paper* is a kind of wall-paper, having raised figures resembling cloth, made of flock, or of cloth cut up very fine, and attached to the paper by size or varnish.

Flodden (flod'en), a village of England, in Northumberland, about 5 miles S. E. of Coldstream. Near it was fought the celebrated battle in which James IV of Scotland was defeated by the Earl of Surrey (Sept. 9, 1513).

Flogging (flog'ing), the infliction of stripes or blows with a whip, lash, or scourge, especially as a judicial punishment. As a punishment it has practically ceased in both the army and navy, though formerly very common. In the United States the whipping-post is maintained as part of the penal methods in the State of Delaware. The chastisement is chiefly imposed for larceny and also for wife-beating. The punishment of the knout in Russia and of the bastinado in the East are severe forms of this punishment.

Flood (flud), HENRY, an Irish orator and politician, born near Kilkenny in 1732; died in 1791. He entered the Irish Parliament in 1759, was privy-councillor for Great Britain as well as for Ireland in 1775, vice-treasurer for Ireland 1775-81. In 1783 he had a personal dispute in the house with Grattan, when a remarkable display of the power of invective was made on both sides. He afterwards became a member of the British Parliament. His speeches and some poetical pieces have been published.

Flood-plain, a plain formed by successive river overflows, extending a considerable distance on each side of a stream and made up of layers of mud, sand, and gravel deposited by the water. Some of these are very wide and usually very level in surface. Notable among such plains are those of the Mississippi, the Amazon, the Nile, and the Ganges.

Floods, or INUNDATIONS, river overflows or ocean inundations. Long-continued rains and melting snows are apt to produce them in rivers; especially the sudden and violent rains known as cloudbursts; also the breaking of reservoir dams. The ocean may cause them through the breaking of dykes or

the overflow of lowlands during severe storms or from earthquake convulsions. Striking examples of river floods are those of Johnstown, Pennsylvania, in 1889, by which several thousand people were drowned, and that of the Hoang Ho, China, in 1853, which caused a frightful loss of life. The dykes of Holland have given way on several occasions, drowning large numbers of people. A cyclone wave in Bengal in 1876 caused a flood in which 200,000 people were drowned. Unprecedented floods in the Ohio and Mississippi valleys in 1913 killed hundreds of persons and destroyed a vast amount of property.

Floor-cloth (flōr), a useful substitute for carpet, the basis of which is a strong open canvas. It is woven 6 to 8 yards wide, and in lengths of from 100 to 113 yards. A length of 60 to 100 feet of canvas is stretched in a frame, brushed with glue-size, and rubbed with pumice-stone. It then receives two or three foundation coats of paint on each side. Each coat on the front is smoothed with pumice-stone. When this operation is completed the cloth is transferred to the printing-room, where the pattern is printed in oil colors by blocks, as in calico-printing.

Floorwalker, a person employed in the large department stores to watch the behavior of employees, to give information to applicants, and to settle any disputes or difficulties that may arise.

Flora (flō'ra), the Roman goddess of flowers and spring, whose worship was established at Rome in the earliest times. Her festival, the Floralia, was celebrated from April 28th to May 1st, with much licentiousness. In botany, *flora* signifies the plants of a region collectively, as *fauna* signifies the animals.

Floral Games. See *Jeux Floraux.*

Floréal (flō-rā-ål; month of flowers), the eighth month in the calendar of the French revolution. It began April 20th, and ended May 19th.

Florence (flor'ens; Italian, *Firenze;* in old Italian and in poetry, *Fiorenza;* ancient *Florentia Tuscorum*), a celebrated city of Italy, capital of a province of same name, 143 miles northwest from Rome, and 50 miles E. N. E. from Leghorn. The city is surrounded by hills, and is beautifully situated on both banks of the Arno, but the greater part of it lies on the right bank. Six bridges connect the banks of the Arno, and on either side of the Arno is a spacious quay called the Lung' Arno, a favorite promenade. The private dwellings are mostly handsome, and the palaces, of which there are many, are noble and impressive structures. The city contains numerous piazzas or squares, the most important of which is the Piazza della Signoria, surrounded by important buildings, and adorned with a marble fountain, and a bronze statue of Cosmo I, by John of Bologna. In this piazza is situated the Palazzo Vecchio, originally the seat of the government of the republic, and subsequently the residence of Cosmo I. The most remarkable building in Florence is the Duomo, or cathedral of St. Maria del Fiore, erected 1298-1474, but its façade not completed till 1887, surmounted by the magnificent dome of Brunelleschi, and situated in a spacious square nearly in the center of the city. Near the cathedral are the campanile designed by Giotto, and the small church of St. John (San Giovanni), the Baptistery, the three bronze gates of which, with figures in high relief, are celebrated as among the most beautiful works of the kind extant. One of these is by Andrea Pisano, the two others by Ghiberti. The church of S. Croce is the burial-place of many of the most eminent Tuscans, contains much fine sculpture and many interesting tombs, amongst others those of Michael Angelo Buonarotti, Galileo, Machiavelli, and Alfieri. In the Piazza S. Croce stands Dante's monument by Pazzi, inaugurated 1865. The chief art collection is the Galleria degli Uffizi. In this gallery are contained specimens of painting and statuary by the greatest masters in these arts. In statuary, among numerous antiques may be specified the *Venus de' Medici*, the *Apollino*, the *Knife-grinder*, the *Dancing Faun*, the *Wrestlers*, and the group of *Niobe and her Children;* and in painting there are works by Michael Angelo, Raphael, Titian, Fra Angelico, Fra Bartolomeo, Andrea del Sarto, Correggio, Guido, and numerous others of the first names in various schools. Other important art collections are preserved in the various churches and palaces, one of the principal being that in the Pitti Palace. The building formerly known as the *Bargello*, erected about 1250 for the chief magistrate of the republic, and subsequently used as a prison, has recently been restored, and is now opened as a national museum, illustrative of the history of Italian culture and art in medieval and modern times. The Laurentian or Medicean Library contains upwards of 9000 ancient MSS. The Magliabecchian Library is the great repository of printed

books. The Biblioteca Marucelliana and the Biblioteca Riccardiana are also important public libraries. The charitable institutions are numerous and important. Schools and other literary and educational establishments are also numerous. The manufactures have greatly fallen off, but still embrace woolens, silk, straw hats, porcelain, mosaics, and numerous objects in the fine arts.

Florence was probably founded by the Romans in the 1st century B. C., and early attained considerable prosperity. During the dark ages it was frequently devastated, but it revived about the beginning of the 11th century, at which time the Florentines became extensive European traders. Their silk and woolen fabrics excelled, and their skill as workers in gold and jewels was unsurpassed. About this time Florence took an active part in the feud which broke out between the Guelphs and Ghibellines, the town generally supporting the former against the imperial party. In 1283 a species of republic was constituted; but about the year 1300 the party struggles again burst forth between the same rival families under the new names of the *Whites* and the *Blacks*, in which the Blacks (the Guelphs) were eventually victorious, and the Whites, among whom was the poet Dante, banished. In the course of these troubles a family of merchants named the Medicis rose to great influence in Florentine politics. One of them, Cosmo, born in 1389, was the founder of the political greatness of his house. His grandson, Lorenzo, surnamed *Il Magnifico*, as a statesman, scholar, and patron of art and literature, attained the highest celebrity. Under him Florence, which, though calling itself a republic, was in reality ruled by him, rose to a great pitch of opulence and power, and notwithstanding the hostility of the pope he exercised a great influence throughout Italy. On the fall of the republic in the 16th century a member of a lateral branch of the Medici, the line of Cosmo having become extinct, was chosen by Charles V as Duke of Florence. The ducal dynasty of Medici continued to rule till the year 1737, when, becoming extinct, they were succeeded by Francis of Lorraine, afterwards Emperor of Germany. From this period the history of Florence merges into that of Tuscany until its amalgamation with the Kingdom of Italy. From 1865 till 1871 it held the dignity of capital of the kingdom, the seat of government being transferred to it from Turin. Amongst the illustrious men it has produced are Dante, Petrarch, Boccaccio, Guicciardini, Lorenzo de' Medici, Galileo, Michael Angelo, Leonardo da Vinci, Benvenuto Cellini, Andrea del Sarto, Amerigo Vespucci, Machiavelli, and others. Population at last census 220,879.—The province has an area of about 2262 English square miles. The surface is beautifully diversified by mountains, valleys, and plains. The climate is generally mild and healthy, and the soil very fertile. Pop. 937,786.

Florence, Council of, along with that of Ferrara, a continuation of the Council of Basel, with sessions at intervals from 1439 to 1442. Its object was a reunion of the eastern and western churches; but the agreement was later repudiated by a council at Constantinople.

Florence, a city, capital of Florence County, South Carolina, 102 miles N. of Charleston. It has railroad shops, cotton-gins, plow, fertilizer and other factories, and a State Industrial School for Boys. Pop. 9000.

Florence, a city, capital of Lauderdale County, Alabama, at the head of deep water navigation on Tennessee River. It contains a State normal school. It is in a coal and iron region and has large manufactures. Pop. 7500.

Florentine Work (flor'en-tēn), a kind of mosaic work, consisting of precious stones and pieces of white and colored marble, which has long been produced in Florence. It is applied to jewelry, and used for table tops, etc.

Flores (flō'res), or Floris, an island of the Indian Archipelago, one of the chain which extends east from Java. It is about 230 miles long and from 15 to 35 miles wide, and has a mountainous surface, with several volcanic peaks. The natives are tall and robust frizzly-haired savages, belonging to the dark Papuan race. The island is under Dutch supremacy. Sandalwood, bees'-wax, and horses are exported. The passage between the east end of the island and those of Solor and Adenara is called Flores Strait; and the part of the Pacific north of the Flores chain and south of Celebes is called the Flores Sea.

Flo'res, the most westerly island of the Azores, about 30 miles long by 9 miles broad, with a hilly surface. The chief products are wheat, pulse, and poultry, and great numbers of small cattle are reared. Pop. about 10,000.

Floret (flō'ret), a single small flower in a compact inflorescence, as in the compound flower of the Compositæ, or in the spikelet of grasses.

FLORIDA
Scale of Miles
0 10 20 30 40 50 60
Size of type indicates relative importance of places
NORTHWESTERN PART OF FLORIDA
Same scale as large map
GULF OF MEXICO
ATLANTIC OCEAN
Lake Okechobee
Big Cypress Swamp
Okefinokee Swamp
Apalachicola Bay
Tampa Bay
Pensacola
Key West
Fernandina
Jacksonville
St. Augustine
Palatka
Gainesville
Ocala
Lake City
Tallahassee
Apalachicola
Tampa
St. Petersburg
Orlando
Kissimmee
Lakeland
Bradentown
Punta Gorda
Fort Myers
Miami
Pensacola
Longitude West from Greenwich
O.S. HAMMOND & CO., N.Y.

Florian (flo-re-on), JEAN PIERRE CLARIS DE, a French writer, born 1755; died 1794. He was patronized by Voltaire, and gained fame as a writer of fables, pastorals, romances, and comedies. He was imprisoned during the revolution, but the fall of Robespierre saved him from the guillotine. His romances *Galatée, Estelle, Gonzalve de Cordoue, Numa Pompilius*, his fables, and translation of *Don Quixote* are his best works.

Florianopolis (flo-ri-an-op'ō-lis), formerly Desterro, capital of the province of Santa Catharina, Brazil, on the western shore of Santa Catharina Island. It is the chief commercial center of the state. Pop. about 15,000.

Floriculture (flo-ri-kul'tūr), the culture or cultivation of flowers or flowering plants, whether in open beds, in gardens, in conservatories or greenhouses, or in rooms in dwelling-houses.

Florida (flor'i-dȧ), one of the United States, forming the southeastern extremity of the country, and having the Gulf of Mexico on the south and west, and the Atlantic on the east. It consists partly of a peninsula stretching south for about 400 miles, partly of a long, narrow strip of land running along the Gulf of Mexico to a distance of 350 miles from the Atlantic coast-line. The peninsula is about 90 miles in width, and contains about four-fifths of the total area, which is 58,666 sq. miles. The surface is in general level, rising little above the sea, especially in the southern parts. Here, however, the swamps or everglades are being drained by the state, and becoming the most valuable lands in Florida. The northern portion is more broken and elevated. The principal river is the St. John's. Its tributary, the Ocklawaha, has its course so flat that for a long distance it spreads out into the forest for half a mile or more on either side, so that nothing is seen but trees and water. The Appalachicola, Suwanee, etc., flow into the Gulf of Mexico. There are many lakes throughout the peninsula, the largest being Okeechobee (area 650 sq. miles). Numerous islands are scattered along the south and west coasts, the most remarkable of which is a group, or rather a long chain, called the Florida Keys at the southern extremity of Florida. The most important of these is Key West, containing the city and naval station of same name. The state produces tropical fruits in great perfection, especially oranges, lemons, limes, grapefruit and pineapple. The planting of orange groves has been carried on extensively in recent times, and oranges are now a specialty of Florida. Tobacco, cotton, sugar, maize, potatoes, rice, oats, etc., are among the other productions. The forests form an important source of wealth. The minerals are unimportant, with the exception of phosphates and Fuller's earth, mined in large quantities. Among the wild animals are the puma, manatee (sea cow), alligator, crocodile, bears and wild cat (lynx). Birds are extremely numerous and varied. The coasts, rivers, and lakes swarm with fish; tortoises and turtles also abound. As regards climate, Florida may be divided roughly into three zones, "southern," semi-tropical and sub-tropical. The mean annual temperature is 70.8° F., and the rainfall averages 52 inches. The state is much frequented as a winter health resort for invalids, especially St. Augustine, Ormond, Daytona, Palm Beach, Miami, Tampa, White Springs, etc. Florida, long in a backward condition, has recently made great advances in prosperity, being now well supplied with means of communication, and town and villages rapidly springing up. Tallahassee is the capital and seat of government. Jacksonville, Pensacola, Key West, and Tampa are thriving ports; St. Augustine is the oldest town in the United States. Proposals have been made to construct a ship-canal through Florida as a short route from the Atlantic to the Gulf of Mexico. Florida was first explored in 1512 and 1516 by Ponce de Leon, a Spanish adventurer. It was ceded to Great Britain by Spain in 1763 in exchange for Cuba, reacquired by the Spaniards in 1781, and confirmed to them at the peace of 1783. It was ceded to the United States in 1821, and organized as a territory in 1822. A long series of conflicts with the Seminole Indians retarded its prosperity. In 1845 it was admitted into the Union. In 1861 it seceded from the Union, to which it was not readmitted till 1868, when it adopted a new constitution. Pop. (1910) 752,619

Florida, GULF OF, the narrow sea between Florida, Cuba, and the Bahama Islands.

Florida Keys. See *Florida*.

Florideæ (flor'id-e-ē), a name given to the rose-spored algæ, now more generally known as rhodosperms.

Florid Gothic, that highly-enriched variety of Gothic architecture which prevailed in England in the fifteenth and at the beginning of the sixteenth century; often called the *Tudor style*, as it prevailed chiefly during the Tudor era.

Florin (flor'in), a name given to different coins of gold or silver of different values, and to moneys of account, in different countries. The English florin is 2*s.* or one-tenth of a pound sterling; the Austrian *gulden* or florin and the *guilder* or florin of Holland are each 1*s.* 8*d.* A gold florin value 6*s.*, was used in England in the reign of Edward III.

Florinians (flor'in-i-anz), a sect of Gnostics of the second century, so called from *Florinus*, a Roman priest who was excommunicated by Pope Eleutherius in 176.

Florio (flor'i-ō), JOHN, lexicographer and translator, born in London of Italian parents in 1545; died 1625. He taught French and Italian in Oxford University. He was appointed by James I teacher of languages to the queen and Prince Henry. His chief works are his *Italian and English Dictionary*, the *World of Words*, and his translation of Montaigne. Shakespere is said to have ridiculed him in the character of Holofernes in *Love's Labor's Lost*.

Floris (flo'ris), FRANS, a Flemish painter, whose family name was Vriendt, born at Antwerp in 1520; died there 1570. At Antwerp he established a school for painters, which produced many eminent artists. His chief works are: *The Fall of the Rebel Angels*, in the Louvre; *The Last Judgment*, in the church of Nôtre Dame, Brussels, and *The Assumption*, in Antwerp Cathedral. Other works are to be met with in Flanders, Holland, Spain, Paris, Vienna, and Dresden.

Florus (flo'rus), LUCIUS ANNÆUS, a Roman historian, was probably a native of Spain or Gaul. He is variously styled in the MSS.: in some *L. Annæus Florus*, in others *L. Julius Florus*, in others *L. Annæus Seneca*, and in one simply *L. Annæus*. He lived in the beginning of the second century after Christ, and wrote an epitome of Roman history in four books, from the foundation of the city to the first time of closing the temple of Janus, in the reign of Augustus.

Floss-silk, the portions of raveled silk broken off in reeling the silk from the cocoons, carded and spun into a soft coarse yarn, and used for common fabrics, embroidery, etc.

Flotow (flō'tō), FRIEDRICH ADOLPHUS VON, a German musical composer, born 1812; died 1883. He studied music in Paris, but his earlier operas did not find favor with the Parisian opera-house directors, so he had to content himself with performances in the aristocratic private theaters. At length the *Naufrage de la Méduse* was successfully produced at the Théâtre Renaissance in 1839. This was followed by *L'Esclave de Camoëns* (1843), and *L'Ame en Peine* (1846), performed in London as *Leoline*. *Alessandro Stradella* was first performed at Hamburg in 1844, and his most successful work, *Martha*, at Vienna in 1847. He wrote later plays and was director of the court theater at Schwerin from 1855 to 1863. The last years of his life were chiefly spent at Vienna.

Flotsam, JETSAM, AND LIGAN, in law. *Flotsam*, or *floatsam*, is derelict or shipwrecked goods floating on the sea; *jetsam*, goods thrown overboard which sink and remain under water; and *ligan*, goods sunk with a wreck or attached to a buoy, as a mark of ownership. When found, such goods may be returned to the owner if he appear; if not, they are the property of the finder.

Flounder (floun'der), one of the flat-fishes, family Pleuronectidæ, genus *Pleuronectes* or *Platessa*, the common flounder being the *Pleuronectes* or *Platessa flesus*. It is one of the most common of the flat-fishes, and is found along the shores of almost all countries. The body is extremely flattened at the sides. Flounders have been successfully transferred to fresh-water ponds. They feed upon crustacea, worms, and small fishes, and are much used as food. The Argus flounder is the *P. argus*, and is a native of the American seas.

Flour, the edible part of wheat, or any other grain, reduced to powder, and separated from the bran and the other coarser parts by sifting. The quality of flour depends principally on the fineness of the sieves through which it is passed and the amount of bran which it contains. The finest flour is obtained in the first grinding of the wheat. The other kinds—biscuit flour, middlings, seconds, etc.—consist of the flour which remains after the first grinding, ground and passed through coarser sieves.

Flourens (flō-răn), GUSTAVE, a French socialist, born at Paris 1838; died 1871. In 1863 he was deputy professor in the College of France, and published his lectures under the title of *Histoire de l'Homme*. After being engaged in democratic movements in Turkey and Italy he joined the Paris Commune in 1871, and was killed in a conflict at Rueil, near Malmaison.

Flourens, MARIE JEAN PIERRE, a French physician and physiologist, born in 1794; died in 1867. In 1828 he was elected a member of the Academy of Sciences, in 1832 was appointed to the chair of comparative anatomy at the Jardin des Plantes, Paris. In 1833 he became permanent secretary to the Academy of Sciences, in 1840 member of the French Academy. In 1846 he was created by Louis Philippe a peer of France. His works include *Expériences sur la Système Nerveux, Developpement des Os, Anatomie de la Peau, Mémoires d'Anatomie et de Physiologie Comparées, De l'Instinct et de l'Intelligence des Animaux,* and *De la Vie et de l'Intelligence* (1858).

Flower (flou'er), in popular language, the blossom of a plant, consisting chiefly of delicate and gaily-colored leaves or petals; in botany, the organs of reproduction in a phenogamous plant. A complete flower consists of *stamens* and *pistils,* together with two sets of leaves which surround and protect them, the *calyx* and *corolla.* The stamens and pistils are the essential organs of the flower. They occupy two circles or rows, the one within the other, the stamens being in the outer row. The stamens consist of a stalk or *filament* supporting a roundish body, the *anther,* which is filled with a powdery substance called the *pollen.* The pistil consists of a closed cell or *ovary* at the base, containing *ovules,* and covered by a *style* which terminates in the *stigma.* These organs are surrounded by the corolla and calyx, which together are called the *floral envelope,* or when they both display rich coloring the *perianth.* The leaves of the corolla are called *petals,* and those of the calyx *sepals.* Some flowers want the floral envelope, and are called *achlamydeous;* others have the calyx but are without the corolla. and are called *monochlamydeous.* Flowers are generally *bisexual,* but some plants have *unisexual* flowers; that is, the pistils are in one flower and the stamens in another. See also *Botany.* The figure shows the flower of *Cheiranthus Cheiri* (common wallflower); *a,* peduncle; *b,* calyx; *c,* corolla; *d,* stamens; *e,* pistil.

Parts of Flower.

Flower, BENJAMIN ORANGE, author and publisher, was born at Albion, Illinois, in 1858. He edited the *American Sentinel* till 1888, subsequently founded and edited the *Arena,* and later *The Coming Age.* He wrote *Civilization's Inferno; Persons, Places, and Ideas,* etc.

Flower, SIR WILLIAM HENRY, zoologist, born at Stratford-on-Avon in 1831. After filling several posts, he became in 1884 natural history director at the British Museum and was knighted in 1892. His works, which are highly esteemed, include *Introduction to the Study of Mammals, The Horse: A Study in Natural History,* etc.

Flower-de-lis. See *Fleur-de-lis.*

Flowering Fern, the popular name of *Osmunda regālis,* nat. order Osmundaceæ. It is one of the noblest and most striking of our ferns, and grows in boggy places and wet margins of woods. It derives its name from the upper pinnæ of the fronds being transformed into a handsome panicle covered with sporangia.

Flowering Rush (*Butōmus umbellātus*), nat. order Butomaceæ, a beautiful plant found in pools and wet ditches of England and Ireland, but rare in Scotland. The leaves are 2 to 3 feet long, linear, triangular, their sharp edges sometimes cutting the mouths of cattle, whence their generic name *Butōmus* (ox-cutting). The scape or flowering stem terminates in a large umbel of rose-colored flowers.

Flowers, formerly a chemical name for fine particles of bodies in the form of a powder or mealy substance, as the *flowers of sulphur,* etc.

Flowers, ARTIFICIAL, imitations of real flowers, made of various materials. These are not a modern invention. The Romans excelled in the art of imitating flowers in wax, and in this branch of the art attained a high degree of perfection. The Egyptian artificial flowers were made of thin plates of horn stained in different colors, sometimes also of leaves of copper gilt or silvered over. In modern times the Italians were the first to acquire celebrity for the skill and taste they displayed in this manufacture, but they are now far surpassed by English and French manufacturers, more especially by the latter. Among materials used in this manufacture are cambric, muslin, satin, velvet, and other woven fabrics, feathers, India rubber, blown glass, mother of pearl, brass, etc.

Floyd (floid), JOHN BUCHANAN, politician and soldier, born at Blacksburg, Virginia, in 1807; died 1863. He was Governor of Virginia in 1850-53, and in 1859 was appointed Secretary of

War. When war became probable between the North and South he sent munitions of war southward and at the close of 1860 went to Virginia, where he became a brigadier general in the Confederate army. He lacked military ability, was easily beaten by Gen. Rosecrans in West Virginia, and when in command at Fort Donelson stole away in the night, leaving to a subordinate officer the ignominy of surrendering the fort. He was censured for this act by the Confederate government.

Fluid (flö'id), a body whose particles on the slightest pressure move and change their relative position without separation; a liquid or a gas, as opposed to a *solid*. Fluids are divided into *liquids*, such as water and bodies in the form of water; and *gaseous bodies* or aeriform fluids. Liquids have been also termed *non-elastic fluids*, for although they are not altogether void of elasticity, they possess it only in a small degree. Air and aeriform bodies have been called *elastic fluids* on account of their great elasticity.

Flukes (flöks), or FLUKE-WORMS, a name given to certain parasitic Scolecida (tapeworms, etc.), belonging to the division of Platyelmia or Flat-worms, and included in the order Trematoda. They inhabit various situations in different animals—mostly in birds and fishes. The *Distŏma hepaticum* exists in large numbers in the livers of sheep, and causes the disease known as 'rot.' Like the tapeworms, the flukes pass through an elaborate development.

Fluohydric Acid (flö-ō'hī-drik), same as *Hydrofluoric acid*.

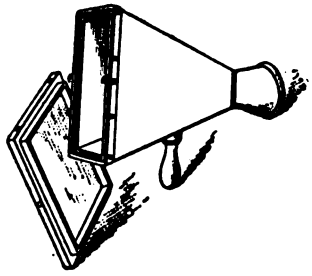
Fluorescence (flö-u-res'ens), a name given to the phenomena presented by the invisible chemical rays of the blue end of the solar spectrum when they become luminous and visible by being sent through uranium glass, or solutions of quinine, horse-chestnut bark, or *Datūra stramonium*. In this way green crystals, as of fluorspar, may give out blue rays, due not to the color of the surface of the body, but to its power of modifying the rays incident on it. The phenomenon appears to be identical with *phosphorescence*. It is due to the refrangibility of the rays being lowered or degraded by the action of the substance. The term fluorescence is applied to the phenomenon if it is observed while the body is actually exposed to the source of light; *phosphorescence* to the effect of the same kind, but usually less intense, which is observed after the light from the source is cut off. Both forms of the phenomena occur in a strongly-marked degree in the same bodies. Canary-glass, which is colored with oxide of uranium, is a very convenient material for the exhibition of fluorescence. A thick piece of it held in the violet or ultra-violet portion of the solar spectrum is filled to the depth of from ⅛ to ¼ of an inch with a faint, nebulous light. If the solar spectrum be thrown upon a screen freshly washed with sulphate of quinine, the ultra-violet portion will be visible by fluorescence; and if the spectrum be very pure, the presence of dark lines in this portion will be detected. For a similar phenomenon, presented by the ultra-red rays of the spectrum, see *Calorescence*.

Fluoride (flö'u-rīd), in chemistry, a compound obtained by heating hydrofluoric acid with certain metals, by the action of that acid on metallic oxides or carbonates, by heating electro-negative metals, as antimony, with fluoride of lead or fluoride of mercury, and in other ways.

Fluorine (flö'u-rin) is a colorless, acrid, non-combustible, tasteless, extremely irritating and penetrating, irrespirable, and very active gas. It was first isolated by De Moissan in 1886. Its name is derived from its principal natural compound, fluorspar (which see). Fluorine occurs very sparingly in the free state, but is very abundant in compounds, such as fluorspar, which is present almost everywhere; cryolite, which is a porous rock quite abundant in Greenland, and in sea and mineral waters, bones, teeth, and milk. It is the most active element and is the greatest supporter of combustion, uniting with hydrogen, sulphur, phosphorus, carbon, and many of the metals in the dark. Even the noble metals are attacked by the pure gas. Platinum, gutta-percha, ceresine (a hydrocarbon wax), and lead are able to withstand the action of the gas to some extent. Rubber also is sometimes used as a container for it. When fluorine and hydrogen meet, even in the dark, an explosion occurs, hydrofluoric acid gas being formed. Fluorine decomposes water, hydrofluoric acid and ozone resulting. It is one of the elements that do not combine with oxygen.

Fluoroscope (flö-or'ō-skōp), an apparatus for observing the effects of the Roentgen or X-rays by means of their action on a fluorescent substance. It consists of a tube or box having at one end a screen coated with a fluorescent substance, such as calcium tungstate. When an object is placed between the tube in which the rays are

produced and the screen, the parts which are not transparent to the rays appear



Fluoroscope.

as a shadow on the screen of the fluoroscope.

Fluorspar, DERBYSHIRE SPAR, or FLUORITE (CaF_2), fluoride of calcium, a common mineral found in great beauty in Derbyshire. It generally occurs massive, but crystallizes in simple forms of the monometric system—viz., the cube, octahedron, dodecahedron, etc., and in combinations of the cube and octahedron. Pure fluorspar contains 48.7 per cent. fluorine, 51.3 calcium. It is of frequent occurrence, especially in connection with metalliferous beds, as of silver, tin, lead, and cobalt ores. It is sometimes colorless and transparent, but more frequently it exhibits tints of yellow, green, blue, and red. From the general prevalence of a blue tint in the Derbyshire specimens it is there known as *Blue-john*. It is often beautifully banded, especially when in nodules, which are much prized for the manufacture of vases, and it is made into a great variety of articles, chiefly ornamental. It is used as a flux in metallurgy, and is a source of hydrofluoric acid. Its specific gravity is 3.14, but it is of very inferior hardness (4), being scratchable by apatite.

Flushing (flush'ing; Dutch, *Vlissingen*), a seaport in Holland, province of Zeeland, on the island of Walcheren, at the mouth of the Hond, or West Schelde, here between 2 and 3 miles broad. It is strongly fortified, and has an extensive trade. Pop. 21,807.

Flushing, formerly a village of Queens County, New York, now a part of New York city. It is about 9 miles N. E. of the city hall and is a favorite residence of New York business men.

Flute (flöt), a portable musical instrument, consisting of a tube furnished with six holes for the fingers, and from one to fourteen keys which open other holes. The sound, which is soft and clear in quality, is produced by blowing with the mouth into an oval aperture at the side of the thick end of the instrument. Its useful compass is about two and a half octaves, including the chromatic tones. It is usually made in four pieces, and of box or ebony, sometimes, however, of ivory, silver, or even of glass.

Fluting (flöt'ing), in architecture, channels or furrows cut perpendicularly in the shafts of columns. It is used in the Doric, Ionic, Corinthian, and Composite orders, but never in the Tuscan. When the flutes are partially filled up by a smaller round molding they are said to be *cabled*.

Flux (fluks), a substance or mixture added to assist the fusion of minerals. In the large way, limestone and fluorspar are used as fluxes. In the smelting of iron the flux must be such that it will combine with the earthy matter of the ore, and form a slag, which must neither be too refractory nor fusible. The fluxes made use of in assays or chemical experiments consist usually of alkalies and alkaline salts, as borax, cyanide of potassium, carbonate of potassium, carbonate of sodium, common salt, which render the earthy mixtures fusible by converting them into glass. The fluxes used in pottery are various, but almost all consist of litharge or red lead, borax, carbonates of potassium and sodium, and sand.

Fluxions (fluk'shuns), in mathematics, the analysis of infinitely small variable quantities, an old method of calculation first invented by Newton, which does not essentially differ from that employed in the differential calculus invented by Leibnitz, except in the notation. Newton's notation was adhered to by English writers up to the early part of the present century, but the differential calculus is now universally employed.

Fly (flī), a winged insect of various genera and species, whose distinguishing characteristics are that the wings are transparent and have no cases or covers. By these marks flies are distinguished from beetles, butterflies, grasshoppers, etc. The true flies, or Diptera, have only two wings, viz., the anterior pair. In common language, *fly* is the housefly, of the genus *Musca*. The housefly is found wherever man is, and in hot weather causes a great deal of annoyance. It is furnished with a suctorial proboscis, from which, when feeding on dry substances, it exudes a liquid,

which, by moistening them, fits them to be sucked. From its feet being beset with hairs, each terminating in a disc which is supposed to act as a sucker, it can walk on smooth surfaces, as a ceiling, even with its back down. The female lays her eggs (120 at a time) in horse dung or other refuse; the larvæ are small white worms. They change into pupæ without casting their skins, and in from eight to fourteen days the perfect fly emerges. Their habits render them likely to convey deleterious matter or disease germs on their feet and deposit them on food, and in consequence they are now looked upon as dangerous visitants and a crusade has been organized against them. The very small flies and the very large ones often seen about houses belong to other species. See *Blowfly*, *Botfly*, *Gadfly*.

Fly, a name formerly given to a double-seated carriage or public conveyance; afterwards applied to hackney-carriages or cabs.

Fly-catcher, a name originally given to certain insessorial birds of the genus *Muscicăpa*, tribe Dentirostres, with a bill flattened at the base, almost triangular, notched at the upper mandible, and beset with bristles. Two species are British—the spotted fly-catcher (*M. grisŏla*) and the pied fly-catcher (*M.* [or *Ficedŭla*] *atricapilla*), both about the size of a sparrow. They perch on a branch, where they remain immovable, watching for insects, only leaving to make a sudden dart at a passing fly, which they seize with a snap of the bill, and then return. The white-collared fly-catcher (*M. albicollis*) is a native of Southern Europe. Numerous other birds receive the name of fly-catchers, and some, as the paradise fly-catchers of the Old World, are brilliantly colored. In America some of the tyrant birds (Tyrannidæ) are named fly-catchers.

White-Collared Fly-catcher (*Muscicăpa albicollis*).

Flying (flī'ing), the power of locomotion through the air, possessed by various animals in different degrees. Birds, bats, and many insects can raise themselves into the air and sustain themselves there at will. Squirrels, phalangers, some lizards, one of the tree-frogs, and flying-fish can move through the air in one direction for a short time, but cannot, strictly speaking, fly. The wing of a bird or insect is an elastic, flexible organ, with a thick anterior and a thin posterior margin; hence the wing does not act like a solid board, but is thrown into a succession of curves. When a bird rises from the ground it leaps up with head stuck out and expanded tail, so that the body is in the position of a boy's kite when thrown up. The wings are strongly flapped, striking forwards and downwards, and the bird quickly ascends. It has been shown that the wing describes a figure of 8 in its action, the margin being brought down so that the tip of the wing gives the last blow after the part next the trunk has ceased to strike; hence, standing in front of a bird, the wing would be divided into two, the upper surface of one-half and the lower surface of the other being visible at the same time. These portions are reversed when the wing is drawn back and towards the body, before beginning another stroke; but it will be observed that during retraction the wing is still sloped, so that the resemblance to a kite is maintained. There are many varieties of flight among birds; of these the most remarkable is the sailing motion, in which the wings are but slightly moved. Probably the original impetus is maintained by the kite-like slope of the wing and advantage may be taken of currents by a rotation of the wing at the shoulder, a movement invisible at any distance. If the extinct Pterodactyles are excepted, all animals other than birds, bats, and insects, which move through the air, as squirrels, flying dragons, etc., do so as parachutes, going from higher to lower levels, but never rising nor flying horizontally.

Flying, Artificial. See *Aëronautics*.

Flying Boat. See *Hydro-aeroplane*.

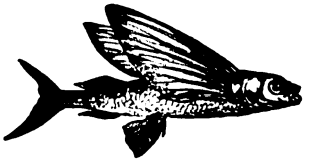
Flying Bridge, a bridge made of pontoons, light boats, hollow beams, casks, or the like. The term is also applied to a kind of ferry in which the force of the current of a river is applied to propel a boat guided by a cable fastened from the one side to the other.

Flying Buttress. See *Buttress*.

Flying Dragon, or Flying Lizard. See *Dragon*.

Flying Dutchman, a phantom ship said to be seen in stormy weather off the Cape of Good Hope, and thought to forebode ill luck. One form of the legend has it that the ship is doomed never to enter a port on account of a horrible murder committed on board; another, that the captain, a Dutchman, swore a profane oath that he would weather the Cape though he should beat there till the last day. He was taken at his word, and there he still beats, but never succeeds in rounding the point. He sometimes hails vessels and requests them to take letters home from him. The legend is supposed to have originated in the sight of some ship reflected from the clouds. It has been made the groundwork of one or two novels, and an opera by Wagner.

Flying Fish, a name common to various fishes which have the power of sustaining themselves



Common Flying Fish (*Exocœtus volitans*).

for a time in the air by means of their large pectoral fins. Generally, however, the name is limited to the species of the genus *Exocœtus*, which belongs to the family Scomberesocidæ (mackerel-pikes). The pectoral fins, which are very large, in the warmer parts of the Atlantic, and *E. exiliens* of the Mediterranean. By some naturalists this genus has been subdivided into several, characterized by the presence or absence of barbels.

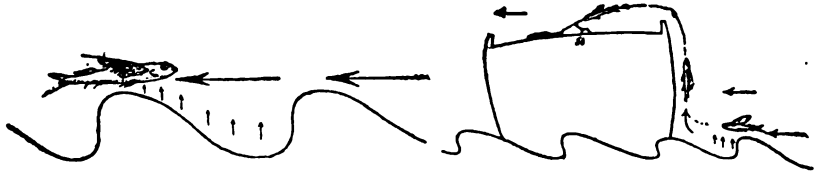
Flying Fox. See *Fox-bats.*

Flying Lemur, a name given to insectivorous mammals, natives of the Indian Archipelago and belonging to the genus *Galeopithēcus*. They possess a flying membrane, which extends as a broad expansion from the nape of the neck to the tail. By means of this membrane they can take extended leaps from tree to tree.

Flying Machine. See *Aëronautics* and *Aëroplane.*

Flying Phalanger, a popular name of the members of a genus of nocturnal marsupials (*Petaurus*) nearly allied to the true phalangers. A fold of the skin extends along the flanks, and this acting as a parachute enables the animal to leap great distances, its heavy tail serving as a rudder to guide its course in the air. These animals inhabit New Guinea and Australia, where they are known as 'flying squirrels.' The species vary in size, the smallest being no bigger than a mouse. They feed on fruit, leaves, insects, etc.

Flying Squid, the popular name of a genus of cephalopodous molluscs (*Ommastrēphes*), allied to the calamaries or squids, having two large lateral fins, which enable them to leap so high out of the water that they sometimes fall on ships' decks.



How Flying Fish Fly.
The arrows indicate the direction of wind and currents of air.

are the principal instruments in their flight, serving to sustain the fish temporarily in the air after it has acquired an initial velocity in its rush through the water. It can pass through the air to a considerable distance, sometimes as much as 200 yards, which it does to escape from the attacks of other fishes, especially the dolphin. It is most common between the tropics. The best-known species are *E. volitans*, abundant

Flying Squirrel (*Pterŏmys*), a genus of rodent animals, family Sciuridæ (squirrels), to which the skin of the flank, extending between the fore and hind legs, imparts the faculty of supporting the animal for a moment in the air, as with a parachute, and of making very great leaps. The European flying squirrel (*P.* or *Sciuroptĕrus Sibericus*) is a native of the forests in the colder parts of Europe and Asia:

the American flying squirrel (*P. volucella*) is common in the United States east of the Missouri.

Fly-trap, the only species known of a genus of plants (*Dionæa*), nat. order Droseraceæ, also called Venus's fly-trap. See *Dionæa*.

Fly-wheel, a wheel with a heavy rim placed on the revolving shaft of any machinery put in motion by an irregular or intermittent force, for the purpose of rendering the motion equable and regular by means of its momentum. Its action depends on the mechanical law that a body once set in motion retains a certain amount of moving force or momentum, which has to be overcome before motion ceases. Thus a heavy wheel which has been made to rotate by some external force such as the pressure on the piston of a steam or internal-combustion engine, continues to rotate after the external force ceases to operate by reason of its stored energy or momentum.

In a steam engine the function of the fly-wheel is to store up energy during the first part of the stroke under full steam pressure; during the latter part of the stroke, when the pressure is decreased the fly-wheel gives out energy which suffices to carry the engine over dead centers. It also equalizes the variation in the leverage with which the varying steam effort acts upon the crank to revolve the shaft and tends to equalize sudden variations in the external load or resistance. In the internal-combustion engine, which is usually single-acting with but one power stroke in every four piston movements, the fly-wheel is of especial importance in regulating the speed. See *Gas Engine*.

Fo (fō), the Chinese name of Buddha. See *Buddha*.

Foch (fōsch), General Ferdinand, famous French soldier, was born 1851 at Tarbe in the Basque country on the borders of Spain, but was raised at Metz. His father was a Bonapartist and was secretary for the prefecture of Tarbes under Napoleon III. He served in the French army in the Franco-Prussian war as a subaltern, and later became captain of artillery. He was made professor of tactics in the Ecole de Guerre with the title of commandant. When he reached the grade of brigadier-general, Clemenceau, who was then premier (1907), appointed him head of the war college. At the Battle of the Marne (September, 1914), maneuvering under General Joffre, he held the center of the French line with 120,000 men opposed to 200,000 Germans. Both his wings were driven back, but he made a terrific attack on the enemy's center, broke the German line and saved the day. He succeeded General Pétain as chief of the general staff of the Ministry of War. Following the renewed advance of the Germans in March, 1918, he was appointed generalissimo of the Allied armies.

Focus (fō'kus), (1) in optics, a point in which any number of rays of light meet after being reflected or refracted by a mirror or a lens. (2) In geom. an important point on the principal axis of the parabola, ellipse, and hyperbola. The ellipse and hyperbola have each two foci, the parabola one, though in the latter case we may suppose a second focus at an infinite distance. The foci were so called from the fact that rays of light proceeding from one focus and reflected from a corresponding reflecting surface pass through the other focus.

Fœtus (fē'tus). See *Fetus*.

Fog, a cloud at or near the surface of the earth, produced by the condensation of the invisible vapor of the atmosphere into minute watery particles, this condensation being caused by a cold current of air or the contiguity of a cold surface. Fogs are more frequent in those seasons of the year when there is a considerable difference of temperature in the different parts of the day. In low, moist places, and in confined places, as valleys, bays, or lakes, surrounded by high lands, they are of frequent occurrence.

Foggia (foj'à), a town of S. Italy, province of Foggia, 123 miles N. E. of Naples, with regular and spacious streets. Its principal edifice is a Gothic cathedral. The trade is chiefly in corn, for which immense granaries have been formed under the streets. Pop. 76,688.—The province, which is partly bounded by the Adriatic, has an area of 2954 sq. miles. It possesses rich pastures, and produces saffron, wine, etc. Pop. 418,510.

Fog-Signals, signals given by means of sound to warn vessels during fogs, when lights or other visible signals cannot be perceived. Various kinds of fog signals are used, among which may be mentioned bells, drums, gongs, guns, compressed-air whistles, steam-whistles, and fog trumpets or horns. One of the most powerful signals is the siren fog-horn, the sound of which is produced by means of a disk perforated by radial slits made to rotate in front of a fixed disk exactly similar, a long iron trumpet forming part of the apparatus. The disks may each contain say twelve slits, and the moving disk may revolve 2800 times a minute; in each revolution there are of course twelve coincidences between the slits in the two disks; through the openings thus made steam or

GENERAL FERDINAND FOCH, GENERALISSIMO OF THE ALLIED ARMIES IN THE WEST

No leader could command greater confidence than the brilliant strategist to whom was mainly due the great victory of the Marne in the first autumn of the war. He also directed the French offensive on the Somme in 1916 and in November, 1917, he was chosen as the French representative and subsequently chairman of the Central Military Committee appointed to assist the Supreme Allied War Council. General Foch was formerly for five years lecturer on strategy and tactics at the Ecole de Guerre.

air at a high pressure is caused to pass, so that there are actually 33,600 puffs of steam or compressed air every minute. This causes a sound of very great power, which the trumpet collects and compresses, and the blast goes out as a sort of sound beam in the direction required. Under favorable circumstances this instrument can be heard from 20 to 30 miles out at sea. Fog signals are also used on railways during foggy weather; they consist of cases filled with detonating powder, which are laid on the rails and exploded by the engine when it runs over them.

Föhr (*feur*), a Prussian island in the North Sea, off the west coast of Schleswig; area, 28 sq. miles; pop. about 4000, mostly Frisians engaged in fishing, the capture of wild fowl, and agriculture.

Foil, a thin leaf of metal, as gold or tin, used for various purposes.

Foil, in fencing, a rod of steel, representing a sword, with a handle or hilt at one end, and a leather button at the other to prevent accidents. Foils measure from 31 to 38 inches in length and must be resilient.

Foix (fwä), a town of France, capital of dep. Ariège, in a valley at the foot of the Pyrenees, with remains of the old castle of the counts of Foix, and an old church and abbey. Pop. (1906) 4498.

Foix, GASTON DE. See *Gaston de Foix.*

Fokien (fo-kē-en'), a maritime province of Southeastern China; area about 40,000 sq. miles. The coast is deeply indented by bays and studded with islands. The interior is generally mountainous, but is highly cultivated and generally fertile. The principal products are rice, wheat, barley, tea, silk, sugar, indigo, camphor, and tobacco. The capital is Foo-choo-foo. Pop. about 25,000,000.

Fokschani (fok-shä'nē), a town of Roumania, on the Miklov, 104 miles N. E. of Bukarest, with an important trade. Pop. 23,783.

Folc-land (fōk-land), that is Folkland, the land of the people, that portion of Anglo-Saxon England which was retained on behalf of the community. It might be occupied in common or possessed in severalty, but could not become allodial estate or absolute private property except with the consent of the Witan or highest council in the land. From time to time large grants were made both to individuals and to communities; and land thus cut off from folc-land was called *boc-land* or 'book-land.' Ultimately the king practically acquired the disposal of it, and the remnant of folc-land became crown lands. See *Feudal System.*

Folc-mote, in Anglo-Saxon England, an assembly of the people to consult respecting public affairs.

Foley (fō'li), JOHN HENRY, sculptor, born at Dublin in 1818; died at Hampstead in 1874. He was admitted a student of the Royal Academy in 1835. In 1848 he was elected an associate, and in 1858 an academician. His works are numerous and highly esteemed. They include statues of Selden and Hampden in Westminster; Goldsmith, Burke, and O'Connell in Dublin; Lord Hardinge and Outram for India; Lord Clyde in Glasgow; the group *Asia* and the colossal statue of Prince Albert for the Albert Memorial, Hyde Park. Foley was buried in St. Paul's Cathedral.

Foliation (fō-li-ā'shun), in geology, the property or quality in certain rocks of dividing into thin laminæ or plates.

Foligno (fo-lēn'yo), a town of Central Italy, province of Perugia, in a beautiful vale of the Apennines, watered by the Clitumnus. Public buildings worthy of notice are the cathedral and the Palazzo Communale. Pop. of commune, 26,278.

Folk (fōk), JOSEPH WINGATE, political reformer, was born at Brownsville, Tennessee, in 1869. He studied law, was admitted to the bar in 1890, and in 1900 became circuit attorney in St. Louis. As such he developed and successfully prosecuted numerous bribery cases, and became so popular that he was elected Governor of Missouri in 1905, filling this office till 1909.

Folkestone (fōk'ston), a seaport of England, County Kent, 6 miles W. by S. of Dover, terminus of the Southeastern Railway, and a chief station for steamers to and from Boulogne. It is a favorite watering place, and has a considerable shipping trade. Folkestone is included in the parliamentary borough of Hythe. Pop. (1911) 33,495.

Folklore (fōk'lōr), a useful term of recent introduction into the English language, signifying a scientific study of popular tales, traditions, primitive beliefs and superstitions, popular customs, usages, festivals, games, etc. Folklore, though it takes cognizance of many apparently trivial matters, is of great importance in the science of comparative mythology, and helps to throw much light on the relationships between races, and on the origin and development of religious beliefs and ceremonies. It

is, therefore, of great assistance to the ethnologist, the sociologist, and the historian, as well as to the student of comparative mythology and of the science of religion. Folklore societies have been formed in several countries, the American society being formed at Cambridge, Mass., in 1888. Its most important purpose is to collect the relics of folklore still existing in America.

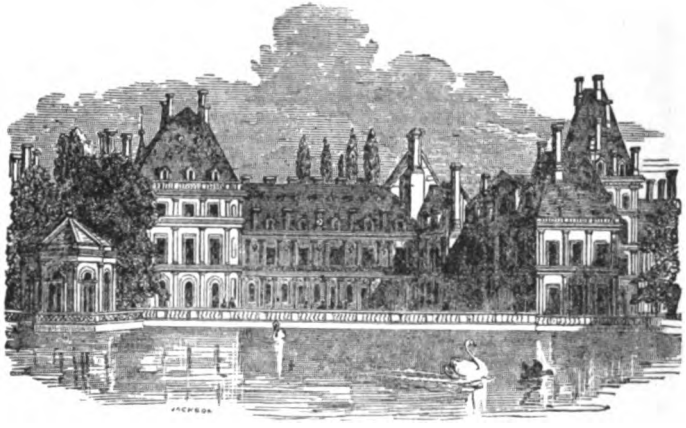
Fomentation (fō-men-tā'shun), in medicine the application of warm liquids to a part of the body, by means of flannels or other cloths dipped in hot water or medicated decoctions, for the purpose of easing pain by relaxing the skin or deeper tissues.

Fonblanque (fon'blangk), ALBANY WILLIAM, an English journalist, born in 1797; died in 1872. He was educated for the bar, but, devoting himself to journalism, he gained a position on the *Times*, the *Morning Chronicle*, and succeeded Leigh Hunt as editor of the *Examiner*. A reprint of many of his articles, under the title *England Under Seven Administrations*, appeared in 1837. In 1852 he was appointed chief of the statistical department of the Board of Trade.

Fond du Lac, a city of Wisconsin, capital of a county of same name at the south end of Winnebago Lake, 60 miles N. by W. of Milwaukee. It is the center of several railways, and has a large trade. The industries include iron founding, carriage and wagon making, tanning, sawmilling, and the manufacture of caskets, refrigerators, cement blocks and candy, etc. Pop. 18,797.

Fondi (fon'dē), a town of South Italy, near a coast lagoon to which it gives name, prov. Caserta. It is a bishop's see, and contains a cathedral. Fondi stands in a plain, the ancient *Cœcubus Ager*, which produced the famous Cæcuban wine. Pop. 9930.

Fonseca (fon'sā'kâ), MANUEL DEODORODE, soldier and president, was born in Brazil in 1827; died in 1892. He spent nearly all his life in the army, being finally made marshal of the empire. Becoming hostile to the government he was deprived of his command and banished. He now became leader of the revolutionists, drove the emperor from the throne and was made dictator and provisional president in 1889. In 1891 he was elected the first president of the Republic of Brazil, but his dictatorial rule led to opposition and he was forced to abdicate.



Palace of Fontainebleau.

Font, the vessel which contains the water for baptism in a church. It is frequently sculptured in stone or marble, with richly decorative designs.

Fontaine, JEAN DE LA. See *La fontaine.*

Fontainebleau (fon-tān-blō), a town of France, dep. Seine-et-Marne, in the midst of the forest of same name, about 2 miles from the Seine and 37 miles S. S. E. Paris. It owes its origin chiefly to the palace, and is a quiet place, with broad, clean streets. Pop. (1906) 11,108. The castle or palace of Fontainebleau is one of the most magnificent in France. It occupies the site of a fortified chateau founded by Louis VII in 1162; this was converted into a mag-

nificent palace by Francis I, and much added to by Henry IV, Napoleon I, Louis Philippe, and Napoleon III. The park is laid out like a vast garden, and adorned with statues, temples, fountains, lakes, and waterfalls. The forest, which is about 50 miles in circumference, covers an area of 42,500 acres, affords numerous pleasant, attractive walks, and abounds with game.

Fontana (fon-tȧ'nȧ), DOMENICO, an Italian architect and engineer, born in 1543; died in 1607. He was employed by Pope Sixtus V in many great works, among the chief of which was the erection of the Egyptian obelisk in front of St. Peter's. Among other buildings erected by Fontana were the Lateran Palace and the library of the Vatican. He also executed important works at Naples.

Fontana, PROSPERO, an Italian painter, born at Bologna in 1512; died at Rome in 1597. He excelled in design and composition, and adorned several churches in Rome and Bologna with historical frescoes. Among his pupils were his daughter LAVINIA (born 1552, died 1614), who excelled in portraits, and the brothers Caracci.

Fontenay-le-Comte (foṇt-nā-lė-kōṇt), a French town, dep. Vendée, 27 miles N. E. of La Rochelle. Has a fine Gothic church with spire 311 feet high; manufactures coarse linen and woolen cloths, and is an entrepôt for the Gironde and Charente wines. Pop. (1906) 7639.

Fontenelle (foṇt-nāl), BERNARD LE BOVIER DE, a French author, born at Rouen 1657; died 1757. In 1674 he went to Paris, and soon became known by his poetical effusions and learned works. Before the age of twenty he had assisted in the composition of the operas of *Psyche* and *Bellerophon*, which appeared under the name of his uncle, Thomas Corneille. In 1681 he brought out his tragedy *Aspar;* but it and the other dramas and pastorales with which he opened his literary career were on the whole unsuccessful. In 1683 appeared his *Dialogues of the Dead*, which were favorably received. His *Discourse on the Plurality of Worlds* (1686) was the first book in which astronomical subjects were discussed with taste and wit. Among his other works are the *History of Oracles* and an *Essay on the Geometry of the Infinite.*

Fontenoy (foṇt-nwä), a village in Belgium, province of Hainaut, celebrated for the battle of May 11, 1745, in which the French under Marshal Saxe defeated the British, Austrian, and Dutch allied forces under the Duke of Cumberland.

Fontevrault (foṇ-tė-vrō), a village of N. W. France, dep. Maine-et-Loire, in a valley 10 miles southeast of Saumur. Here was formerly a rich Benedictine abbey (now a prison) founded in 1099, containing both monks and nuns, and governed by an abbess. The abbey became the head of an order, and had many dependencies. The old monastic buildings, covering from 40 to 50 acres, are now used as a central prison. In the abbey church are the tombs of Henry II and of Richard I, Kings of England and Counts of Anjou, of Eleanor, wife of Henry II, and Elizabeth, wife of John, King of England.

Foo-chow (fu̯-chou), a town of China, capital of the province of Fokien, on the Min, 125 miles N. E. of Amoy. It consists of the town proper, surrounded by walls. and of extensive suburbs stretching along both sides of the river, and communicating by a stone bridge. Foo-chow is one of the five ports thrown open by the treaty of 1843. The trade is very extensive, but the navigation of the river from the sea to the harbor is difficult. Foo-chow has a large arsenal and dockyard superintended by European officers; it is also a great literary center. Pop. estimated at 700,000.

Food. See *Aliment, Dietetics,* and *United States.*

Fool. See *Jester.*

Foolah. See *Fellatah.*

Fools, FEAST OF, the name given to festivals regularly celebrated, from the fifth to the sixteenth century, in several countries of Europe, by the clergy and laity, with the most absurd ceremonies. The feast of fools was an imitation of the Roman Saturnalia, and, like this, was celebrated in December. The chief celebration fell upon the day of the Innocents, or upon New Year's Day; but the feast continued from Christmas to the last Sunday of Epiphany. The young people, who played the chief parts, chose from among their own number a mock pope, archbishop, bishop, or abbot, and consecrated him, with many ridiculous ceremonies, in the chief church of the place. They often travestied the performance of the highest offices of the church, while others, dressed in different kinds of masks and disguises, engaged in indecent songs and dances, and practised all possible follies in the church. Except from their association with the Saturnalia nothing is

known of the origin of these extravagancies, which appear to have been very ancient. They were most common in France, but the feast was also observed in Spain, Germany, England, and Scotland. In France it survived till the year 1644.

Foolscap (fōls'kap), paper of the smallest regular size but one (about 13½ by 16½ inches); so called from its water-mark in early times being the outline of a fool's head and cap, for which British papermakers now substitute the figure of Britannia.

Fool's Parsley, the popular name of *Æthūsa Cynapium*, nat. order Umbelliferæ, which grows wild in some places in the Northern States. It is commonly believed to be poisonous, and serious accidents are said to have occurred from its being mistaken for parsley; but if poisonous it is so only in certain localities. Its unilateral reflexed floral leaves distinguish it from most plants to which it is allied.

Foo-shan (fō-shan), a town of China, prov. of Quangtong, 21 miles S. W. of Canton, on one of the branches of the delta of Si-kiang. Pop. est. at 400,000.

Foot, a measure of length, the name of which is derived from the length of the human foot, containing 12 linear inches.—*Square foot* is a square whose side is one foot, and is therefore equal to 144 square inches.—*Cubic foot* is a cube whose side is 1 foot, and the cube contains 1728 cubic inches. The foot is a common measure in various countries, but its dimensions vary considerably.

Foot, in prosody, a measure consisting of a variety of syllables, two, three, or four, in combinations of long and short, or accented and unaccented. In Greek and Latin verse the feet depend on the *quantity* or length of the syllables, each foot having a distinctive name—trochee, iambus, dactyle, anapest, etc. The same names are applied to English measures, an accented syllable in English being held to be equivalent to a long syllable in Latin or Greek, and an unaccented syllable to a short.

Foot, in animals, the lower extremity of the leg; the part of the leg which treads the earth in standing or walking, and by which the animal is sustained and enabled to step; or that surface of the body by which progression is effected among the mollusca. The foot of man is composed of twenty-six bones, seven of which constitute the tarsus or ankle, which articulates with the leg and corresponds to the carpus (wrist). Five bones form the metatarsus, which corresponds to the metacarpus, and articulates with the tarsus behind, and with the toes in front. The foot is narrow and thick in its posterior part, thinner and broader anteriorly; it forms a right

SKELETON OF THE HUMAN FOOT.

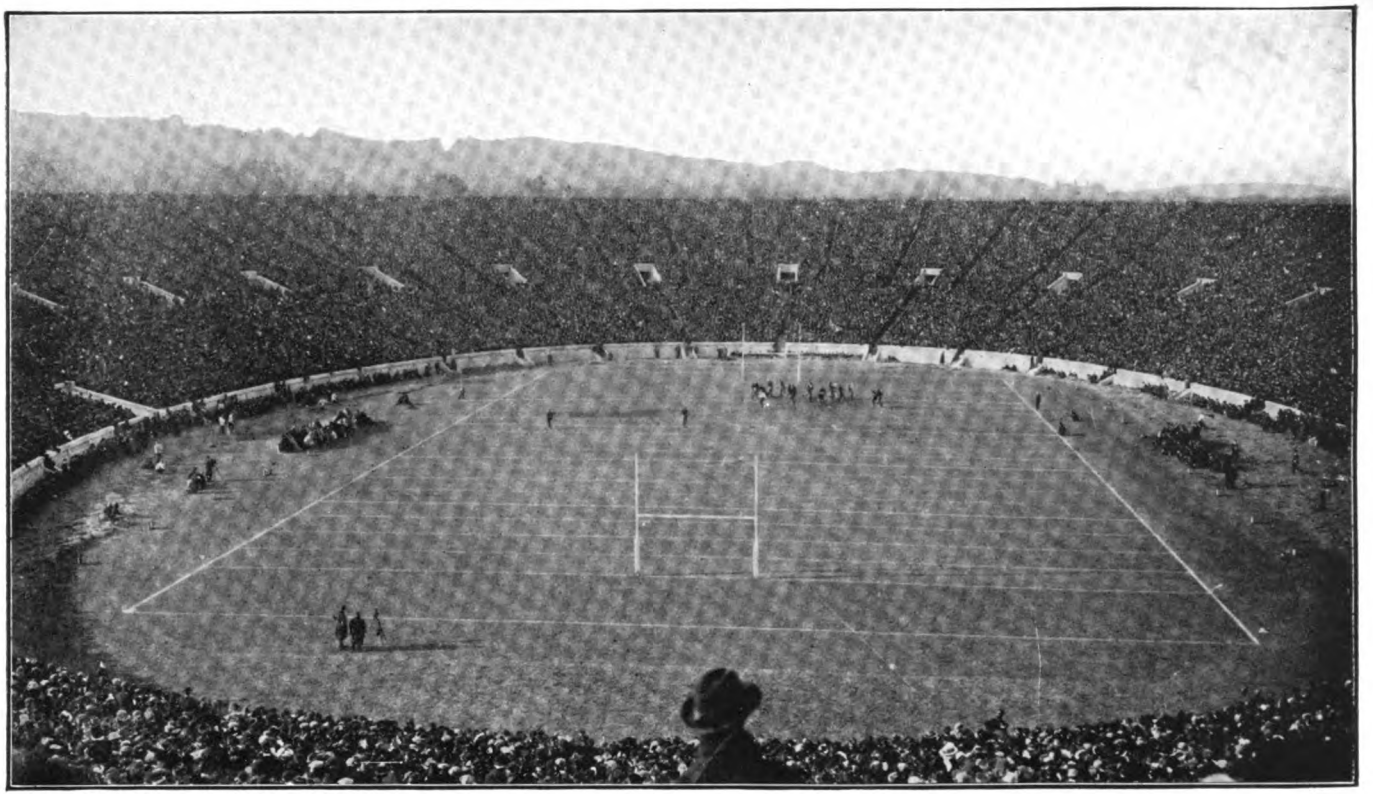
a to *b b*, Tarsus. *b b* to *c c*, Metatarsus. *c c* to *d*, Phalanges. 1, Os calcis, calcaneum, or heel-bone. 2, Astragalus. 3, Scaphoid bone. 4, Inner cuneoid bone. 5, Middle cuneoid bone. 6, Outer cuneoid bone. 7, Cuboid bone. 8 to 12, Metatarsal bones. 13, First row of phalanges. 14, Last row of phalanges.

angle with the leg, and rests upon the ground at the extremities only. The middle portion is in the form of an arch, and, in consequence, resists shocks and supports pressure much better than it could if it were flat and touched the ground throughout its whole length. Absence of the arch constitutes flatfoot.

Foota (fō'tà), a territory of Senegambia, W. Africa, on the lower Senegal, which bounds it on the northeast. It includes Foota Toro, and other districts. Area, about 15,000 sq. m.; pop. estimated at 400,000. The natives profess Mohammedanism, and the country is divided into three districts, each formerly governed by its own chief, subject to a sovereign chosen from a few privileged families. It is now under French control.

Foota-jallon (fō'ta-jal'on), a region of West Africa, intersected by lat. 12° N. and lon. 13° W. It is extremely mountainous, and is the source of the rivers Senegal, Gambia, and Grande. Large herds and flocks are pastured in the highlands; and the soil produces in abundance oranges and bananas, and palm trees, which furnish dates, wine, and oil. The inhabitants are Mohammedans, and are estimated at 700,000.

Foot-and-mouth Disease, a highly contagious eczematous affection which attacks the feet and mouths of cattle, manifesting itself by lameness, indisposition to eat, and general febrile symptoms, with ultimately eruptions of small vesicles on the parts affected, and general indisposition of the animal. The disease occasionally spreads to the udder of milch cattle, and it is believed that it



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A HARVARD-YALE FOOTBALL GAME

View of the Yale Bowl at New Haven, Conn., showing the game in progress and the 78,000 spectators. This great football contest annually draws thousands of people from all over the country.

may be communicated to persons who drink the milk of cows so affected.

Football, an outdoor game of considerable antiquity. In former times towns and villages were often matched against each other, the whole of the able-bodied inhabitants taking part in the struggle; the goals being often miles apart, and usually consisting of natural objects, as a brook or river. The modern form of the game is played by two parties of players, on a large level piece of ground, generally oblong in shape, and having in the middle of either of the ends a goal formed by two upright posts 6 to 8 yards apart, with a bar or tape extended between them at the height of 8 or 10 feet from the ground. There are various styles of playing the game, but the two recognized in all important matches are the Rugby game and the Football Association game, the game played in the United States being a variation of the English Rugby. In both games the main object is for either party to drive the ball (which is *kicked off* in the center of the field) through the goal that their opponents are guarding, and thus count a goal against them. In the Rugby game the goal-posts are 18½ feet apart, and joined by a cross-bar at a height of 10 feet from the ground; and to score a goal the ball must be kicked over this bar by one of the opposite side. In the Association game the upright poles are 8 yards apart, and joined at 8 feet from the ground by a tape, under which the ball must pass to secure a goal. The Rugby game is much rougher and less scientific than the Association game, which discourages rough play and relies mainly on the skilful maneuvering of the ball with the feet, it being forbidden to touch the ball with the hands; while by the Rugby rules the player may catch the ball in his hands, run with it, and kick it dropping. When a goal is made, or at some other arranged interval, the parties change ground for the next struggle, so that any inequalities of situation may be balanced. The roughness of play, and frequent accidents—occasionally fatal—have led to certain modifications in the game, with the purpose of eliminating its more dangerous feature and substituting skill and agility for brute strength.

Foote, ANDREW HULL, naval officer, born at New Haven, Connecticut, in 1806. He entered the navy in 1822, was engaged in suppressing the African slave trade in 1849-52, and was in command of the China station in 1856. Here, while seeking to protect American property when the Chinese were at war with the English, he was fired upon by the Chinese. An apology being refused, he stormed and captured four Chinese forts. In 1862 he commanded the river fleet in the advance on Forts Henry and Donelson and aided Grant in their capture. He was promoted rear admiral in the same year, but died while preparing to join his flagship in 1863.

Foote, SAMUEL, an English comic writer and actor, born about 1720 at Truro; died at Dover in 1777. He was educated at Oxford, and entered the Temple; but after a course of dissipation, to which his small fortune fell a sacrifice, he turned his attention to the stage. He appeared first in Othello, but had little success as a tragedian. In 1747 he opened the theatre in Haymarket, with a dramatic piece which he entitled *The Diversions of the Morning*. It consisted of some very humorous imitations of well-known characters, in detached scenes, written by Foote, who always took the leading parts himself. After 1752 he performed alternately in London and Dublin. He did not obtain a patent for the Haymarket till 1766. Of his numerous plays, above twenty in number, hardly one is now acted. His humor is described by Dr. Johnson and other witnesses as irresistible.

Footguards. See *Guards*.

Footlights, in theaters, the row of lights placed on the front of the stage and on a level with it, to light it up.

Foot-pound, in physics, the term expressing the unit selected in measuring the work done by a mechanical force. A foot-pound represents 1 lb. weight raised through a height of 1 foot; and a force equal to a certain number of foot-pounds, fifty for example, is a force capable of raising 50 lbs. through a height of 1 foot.

Foot-rot, a disease in the feet of sheep, the more common form of which is an inordinate growth of hoof, which at the toe, or around the margin, becomes turned down, cracked, or torn, thus affording lodgment for sand and dirt. In the second form of the disease the foot becomes hot, tender, and swollen; there are ulcerations between the toes, followed by the sprouting of proud flesh.

Footstalk: (1) In botany, a petiole; the stalk supporting the leaf, or connecting it with the stem or branch. (2) In zoology, a process resembling the footstalk in botany, as the muscular process by which certain of the brachiopoda are attached, the stem

which bears the body in barnacles, the stalk which supports the eyes in certain crustaceans.

Foraker (for'a-ker), JOSEPH BENTON, statesman, born near Rainsboro, Ohio, in 1846. He served as a private in the Civil war, afterwards studied law and began practice in Cincinnati in 1869. He was judge of the Superior Court of that city, 1879-82, governor of Ohio, 1885-89, and United States Senator, 1897-1909. He was known as 'the bulldog of politics.' Died May 10, 1917.

Foraminifera (fo-ra-mi-nif'e-ra), an order of animals of low type belonging to the class Rhizopoda, sub-kingdom Protozoa, furnished with a shell or test, simple or complex, usually perforated by pores

FORAMINIFERA (recent).

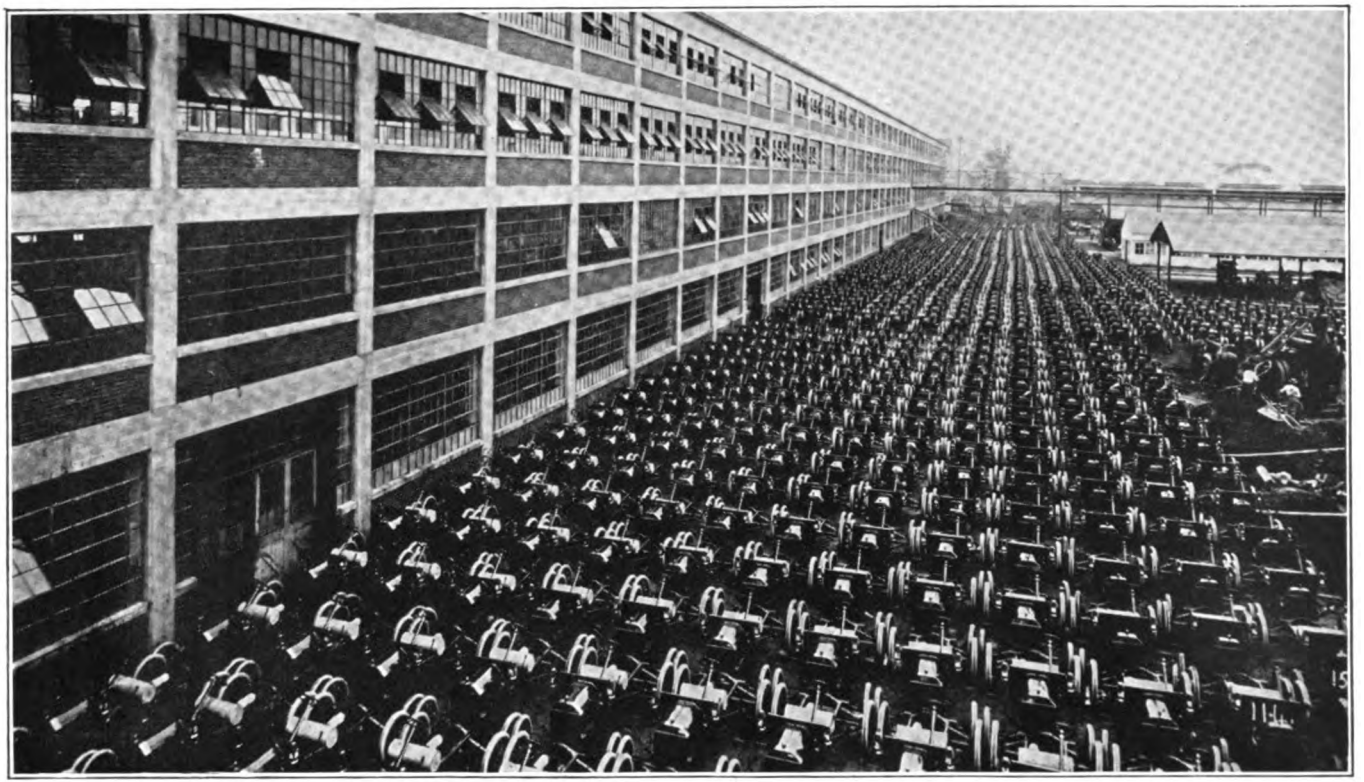
1, Planorbulina Ugeriana. 2, Triloculina tricarinata. 3, Globigerina bulloides. 4, Rotalia Beccarii. 5, Nonionina turgida.

(*foramina*), whence the name. The shell may be composed of horny matter, or of carbonate of lime, secreted from the water in which they live. Owing to the resemblance of their convoluted chambered shells to those of the nautilus, they were at first reckoned among the most highly organized molluscs. In reality they are among the simplest of the protozoa. The body of the animal is composed of granular, gelatinous, highly elastic sarcode, which not only fills the shell, but passes through the perforations to the exterior, there giving off long thread-like processes called *pseudopodia*, interlacing each other so as to form a net like a spider's web. Internally the sarcode-body exhibits no structure or definite organs of any kind. Foraminifera appear very early in the geological formations. The great formation known as white chalk is largely composed of foraminiferous shells, while another remarkable formation known as Nummulitic Limestone receives its name from the presence of coin-shaped foraminifers, generally about as large as an English shilling.

Forbes (forbz), DUNCAN, of Culloden, a Scottish lawyer, lord-president of the Court of Session, born 1685; died 1747. He studied law at Edinburgh and Leyden; was called to the bar in 1709, and immediately after appointed Sheriff of Midlothian. In 1737 he became lord-president of the Court of Session, in the procedure of which he made many improvements. In 1734, in consequence of the death of his brother, he fell heir to the estate of Culloden. He devoted himself to the improvement of the industry of Scotland, and materially aided in laying the foundations of its commercial prosperity. It was mainly owing to his exertions that the rebellion of 1745 was prevented from spreading more rapidly among the clans. He wrote several religious works: *Thoughts on Religion; Reflections on the Sources of Incredulity in Regard to Religion; Letter to a Bishop, etc.*

Forbes, EDWARD, a British naturalist, was born at Douglas, Isle of Man, 1815; died at Edinburgh in 1854. He early devoted himself to science, and having made scientific journeys in Norway, Sweden, France, Germany, etc., he was attached to a scientific expedition to the Mediterranean, the result of which appeared in a report presented to the British Association, and in *Travels in Lycia*. In 1842 he became professor of botany at King's College, London. On the opening of the School of Mines, Forbes was appointed lecturer on natural history as applied to geology and the arts. He still retained his professorship of botany at King's College, and continued to contribute annually some of his most valuable memoirs to the British Association, besides writing for scientific and literary journals. In 1853 he was appointed to the chair of natural history in Edinburgh. Among his more important works, which include a great number of valuable papers on zoological, botanical, and literary subjects, are a *History of the Star-fishes* and *History of British Mollusca*.

Forbes (forbz or for'bes), JAMES DAVID, a Scottish scientist, born in 1809; died in 1868. He was educated at Edinburgh University, and admitted to the Scottish bar. In 1833 he was appointed to the chair of natural philosophy in the University of Edinburgh. In 1860 he became principal of the United Colleges of St. Salvador and St. Leonard, in the University of St. Andrews. His fame rests chiefly on his study of glaciers. His chief publications on this subject are: *Travels through the Alps of Savoy; Norway and its Glaciers; Tour*



A THOUSAND FORDS

At the time of this picture this factory was turning out 2,768 cars a day, so that this represents about a third of a day's work. The machines are completely assembled and need only the bodies to be ready for the road.

of Mont Blanc and Monte Rosa; and *Occasional Papers on the Theory of Glaciers.* Forbes's theory of the glacier was that it was a viscous body, urged down slopes of a certain inclination by the mutual pressure of its parts. See *Glaciers.*

Forbes, SIR JOHN, a Scottish physician, born in 1787; died in 1861. He settled in London in 1840, where he became physician to Queen Victoria. He was the founder of the British and Foreign Medical Review, published a number of professional and other works, and contributed to the *Cyclopedia of Practical Medicine.*

Forbes-Robertson, SIR JOHNSTON, celebrated English actor, born in London, January 16, 1853. He was educated at Charterhouse and studied at the Royal Academy of Arts with the idea of becoming a painter; but in 1874 turned to the theater, making his first appearance in London as Chastelard in *Mary Queen of Scots.* In 1895 he began playing under his own management with Mrs. Patrick Campbell, producing *Romeo and Juliet, Hamlet, Macbeth,* and some modern plays. In 1900 he married the actress Gertrude Elliott, with whom as his leading lady he appeared in Shakespearean and modern plays. He retired in 1914.

Force (fôrs), that which is the source of all active phenomena occurring in the material world, and of which motion, gravitation, heat, light, electricity and magnetism, cohesion, and chemical affinity are believed to be exhibitions. Mechanical force is the power which produces or modifies motion or tends to do so. It has its origin in three causes: (1) gravitation; (2) the unknown cause of the phenomena of light, heat, and electricity; and (3) life. Mechanical forces are of two sorts: one of a body at rest, being the same as pressure or tension; the other of a body in motion, being the same as impetus or momentum. When two forces act on a body in the same *line of direction* the resulting force, or *resultant* as it is called, will be the sum of both forces. If they act in opposite directions the body will remain at rest if the forces be equal; or, if the forces be unequal, it will move with a force equivalent to their difference in the direction of the greater. If the lines of direction make an angle with each other the resultant will be a mean force in an intermediate direction. The *composition of forces* is the combining of two or more into one (actually or hypothetically), which shall have the same effect when acting in some given direction; the *resolution of forces* is the decomposing of a single force into two or more forces, which, acting in different directions, shall be equivalent to the single force. Forces have different denominations according to their nature and the manner in which they act: thus we have accelerating forces, constant forces, parallel forces, uniform and variable forces, etc. The *unit of force* is a single force in terms of which the amount of any other force is ascertained. See *Dynamics, Energy.*

Forceps (fôr'seps), a general name for a two-bladed instrument on the principle of pincers or tongs, used for seizing and holding, and for extracting objects, which it would be impracticable thus to treat with the fingers. Such instruments are used by watchmakers and jewelers, by dentists in extracting teeth, for holding parts in dissection, for extracting anything from a wound, taking up an artery, and by accoucheurs, etc.

Force-pump. See *Pump.*

Forcible Detainer, a violent withholding of the lands, etc., of another from his possession.

Forcible Entry, the violently taking possession of lands or tenements.

Forcing (fôrs'ing), a method of cultivation by which plants, flowers, and fruits are raised at an earlier season than the natural one by protecting them under glass in hot or cold frames, by using stimulating fertilizers, and other means.

Ford, HENRY, automobile manufacturer, was born at Greenfield, Michigan, in 1863. He became a machinist, was chief engineer of the Edison Illuminating Company of Detroit, and finally engaged in automobile manufacture, organizing the Ford Motor Company. The cars built by this company were of small size and cheap construction, their price being so low that the business grew enormously. It has become the largest of its kind in the world, turning out nearly 2000 cars daily and employing 50,000 workmen. The plan of profit-sharing has been introduced, under which $10,000,000 annually has been distributed among the employees. In 1915 Mr. Ford chartered a ship and took a party of peace advocates to Europe, with the hope of in some way ending the war. This enterprise failed.

Ford, JOHN, an early English dramatic author, born in 1586; died about 1640. He entered the Middle

Temple in 1602, and appears to have practised as a lawyer. In 1606 he published a monody on Charles Blount, Lord Mountjoy, afterwards Earl of Devonshire. His dramas are: *The Lover's Melancholy* (1629); *'Tis a Pity She's a Whore* (1633); *The Broken Heart* (1633); *Perkin Warbeck* (1634); *The Fancies Chaste and Noble* (1638); *The Lady's Trial* (1639); *The Sun's Darling* (1657), and several others written in conjunction with Dekker, Webster, and others.

Ford, PAUL LEICESTER, novelist, born at Brooklyn, New York, in 1865. He is best known by his very successful novel, *The Honorable Peter Stirling.* He also wrote *Janice Meredith,* and others; edited the writings of Jefferson and Dickinson, etc. He was killed by his brother, Malcolm, in 1902.

Fordun (for'dun), JOHN, the father of Scottish history, born probably at Fordoun, Kincardineshire, soon after 1300; died about 1386. He wrote the first five books of his history known as the *Scotichronicon* (in Latin), bringing it down to 1153, and part of the sixth, and left materials for its continuation down to his own period. It was resumed about 1441 by Walter Bower, abbot of the monastery of Inchcolm, by whom the five books of Fordun were enlarged, and eleven new ones added, bringing the history down to 1437. It exists in numerous MS. copies, and several printed editions have been published, the best of which is that of W. F. Skene, Edinburgh, 1871-72, with translation.

Fore-and-aft, in ships, a term meaning in a line with the keel. *Fore-and-aft sails* are those that are set on a stay or gaff and boom, such as jibs, staysails, etc.

Forecastle (fōr'kas-l or fōk'sel), a short deck in the forepart of a ship of war, or forward of the foremast, above the upper deck. In merchant ships it is the forepart of the vessel, where the sailors live.

Foreclosure (fōr-klō'zūr), in law, is the right of a mortgagee, or of any one having interest in a mortgage, in the event of the conditions of the mortgage being violated, to compel the mortgagor to redeem the pledge or forfeit his right of redemption.

Foreign Attachment. See *Attachment.*

Foreign Bill of Exchange. See *Bill.*

Forensic Medicine (fō-ren'sik), the branch of medical education which applies the principles and practice of the different branches of medicine to the elucidation of doubtful questions in a court of justice; otherwise called medical jurisprudence.

Foreshortening (fōr-short'en-ing), in drawing and painting, the art of representing figures

Foreshortened (after figure by Raphael).

in such a manner as to convey to the mind the impression of the entire length of any object which is pointing more or less directly towards the spectator standing in front of the picture. The projecting object is shortened in proportion to its approach to the perpendicular to the plane of the picture, and in consequence appears of a just length.

Forest (for'est), a term properly applied to an extensive wood, or to a large tract of mingled woodland and open and uncultivated land; but also given to a large tract of hilly or mountain land wholly or chiefly devoted to the purposes of the chase. (See *Deer-forest.*) Forests proper are of much importance in the general economy of the globe. They greatly affect climate; and their beneficial influence in a physical, economical, and hygienic aspect is now receiving increased attention. Immense forests exist in the Western continent, both in the north and south, the vegetation appearing to possess no limits. In the United States, nevertheless, the forests, though still of great extent, are gradually disappearing; but those of Canada remain very large. In South America, the whole of the valley of the Amazon, which embraces one-third of the entire area of that country, is one vast forest. In Africa also there are forests of immense extent, and the same is the case in Northern Russia, especially in Siberia.

Foresters (for'est-ers), there are several fraternal benefit

FOREST PLANTING REGIONS
OF THE
UNITED STATES
The Unshaded Areas are Treeless
Except Along the Streams
1 EASTERN REGION
2 CENTRAL TREELESS REGION
3 WESTERN REGION
TROPICAL FOREST
TROPICAL FOREST
1
2
3
PACIFIC NORTHWEST FOREST
ROCKY MOUNTAIN FOREST
NORTHERN FOREST
SOUTHERN FOREST

societies under this name, including the Ancient Order of Foresters, founded in England in 1745, established in the United States in 1809; the Foresters of America, founded in 1864, and the Independent Order of Foresters, 1874.

Forestry (for'es-trĭ), the act or art of forming and cultivating forests. The usefulness of forests to man lies: (1) In furnishing him with timber for building, manufacturing, fuel, etc., and with various other useful products of trees. (2) In their influence on climate. (3) In their influence on waterflow, by keeping the ground more moist, making the outflow more regular, checking the rapid melting of snow, and keeping the hillsides from being denuded of their soil, thus setting up streams and covering cultivated valley lands. The necessity of a proper preservation of the forests seems highly evident, but the nations have been slow in waking up to this fact. Several of the countries of Europe have been largely stripped of their woodlands by indiscreet cutting in the poorest countries, and only recently have the nations been roused to the necessity of their conservation. This is now being carefully attended to in several countries, especially in Germany. In China broad mountain regions have been stripped of their trees, with the result that this soil has been swept away by the rains, leaving the rocks bare, while broad reaches of formerly fertile lowlands have been made sterile by the material spread over them by the rains that swept the mountain slopes.

In the United States the broad original forests have been very largely cut away, and those remaining have of late years been so largely reduced by indiscriminate cutting and the ravages of carelessly kindled fires that great alarm is felt as to the future of the lumber supply. Within recent years vigorous efforts have been made to overcome this growing evil. The American Forestry Association, founded in 1882, its purpose being the conservative use of our forest resources, has now over 5000 members, residents of every state, and of Canada and foreign countries. The first State Forest Commission was organized by New York in 1885 and has now a very large forest reserve set aside in the Adirondacks. Pennsylvania has also large forest reserves in its mountain districts, and many other states have taken similar action. The art of forestry is also being taught in the schools, and a large body of skilled foresters are now in the service of the states and the general government. In the Department of Agriculture has been organized a Division of Forestry, and the most earnest efforts are being made to prevent any further needless waste of our woodlands. In the new and active movement for the conservation of national resources the preservation of the public forests ranks high, and to aid in this purpose the government has withdrawn as national forest areas a vast amount of the public lands, amounting at the present time to 192,931,197 acres, an area about equal to that of Texas and Ohio combined. These woodlands are under the charge of the National Forest Service and cared for by about 3000 men, of whom 250 are professional foresters. The trees in these forests are cut with careful discrimination, and new trees are planted to take their place, there being forest nurseries containing about 20,000,000 plants and capable of supplying 18,000,000 a year. New York has 1,600,000 acres in its forest reserve, Pennsylvania over 920,000, and the reserves of the other states amount to a very considerable area. Arbor day is a useful institution in this connection, large numbers of trees being planted on that day and the need of conserving the forests taught to the growing generation in a practical manner.

Forest City, a borough in Susquehanna County, Pennsylvania, 6 miles N. of Carbondale. It has coaling industries, silk and knitting mills, etc. Pop. 5749.

Forest-fly, the popular name of a family (Hippoboscidæ) of two-winged flies, parasitic on birds and quadrupeds.

Forest Marble, in geology, an argillaceous laminated, shelly limestone, alternating with clays and calcareous sandstones, and forming one of the upper portions of the lower Oolite; so called from Whichwood *Forest*, in Oxfordshire.

Forest Park, a residential village in Proviso township, Cook County, Illinois, near Chicago, on the Desplaines River. Pop. 9000.

Forfar (fȧr'far), or ANGUS, a maritime county on the east coast of Scotland, bounded N. by Counties Aberdeen and Kincardine, W. by Perth, S. by the Firth of Tay, and E. by the German Ocean; area 890 sq. miles. The surface is covered in the west and northwest by a portion of the Grampians known by the name of the Braes of Angus, and in the south by part of the Sidlaw Hills. Nearly half the area is under crops and cattle rearing

is carried to great perfection, the chief breeds being shorthorns and polled Angus. The staple manufacture is coarse linens, which is more or less carried on in all the towns and villages, but has its central locality at Dundee. Sandstone flags are largely quarried in the Arbroath district. Pop. 284,078.—The county town, FORFAR, is 13 miles north by east of Dundee. The staple manufacture is linen, especially of the coarser varieties, there being several large factories in the town, in connection with which are several bleachworks. Pop. 12,882.

Forfeiture (for'fi-tūr), a punishment annexed to some illegal act or remissness of an owner or tenant of property, whereby he loses his interest therein, together with his title, the same going to the party injured by such act or remissness.

Forge (fōrj), a workshop or other establishment in which iron or other metal is hammered and shaped by the aid of heat; also, the works where iron is rendered malleable by puddling and shingling. For military purposes a traveling forge is used by forces in the field.

Forgery (fōr'je-ri), at common law, the fraudulent making or alteration of a writing to the prejudice of another man's rights, or making, *malo animo*, of any written instrument for the purpose of fraud and deceit; the word *making*, in this last definition, being considered as including every alteration of or addition to a true instrument. The punishment of forgery at common law is, as for a misdemeanor, by fine, imprisonment, and such other corporeal punishment as the court in its discretion shall award. Most, and perhaps all, of the states in the Union have passed laws making certain acts forgery, and the national legislature has also enacted several on this subject; but these statutes do not take away the character of the offense as a misdemeanor at common law, but only provide additional punishment in cases enumerated in the statutes.

Forget-me-not, the name of *Myosōtis palustris*, nat. order Boraginaceæ, annual and perennial herbs. Nearly fifty species have been described. Scorpion-grass is also a name for it and others of its genus. It is a very beautiful plant, and considered to be the emblem of friendship wherever it is grown. Its flowers are bright blue with a yellow eye. Species are found in the United States. The dark-blue forget-me-not of the Azores (*M. Azorica*) is now cultivated in greenhouses, and is much esteemed for the brilliancy of its flowers.

Forli (fōr-lē'), a town of North Italy, capital of a province of same name, 38 miles southeast of Bologna. It is handsome and well built, has manufactures of silk ribbons, silk twist, woolen stuffs, etc., and a considerable trade. Forli has a cathedral and is a bishop's see. Pop. 43,321.—The province of Forli is bounded on the east by the Adriatic; area 716 sq. miles; pop. 279,072.

Forlorn Hope, a body of men, usually volunteers, selected from different regiments, to lead an assault, enter a breach, or perform other service attended with uncommon peril. The term is of Dutch origin; *hope* being from Dutch *hoop*, a company.

Form, as a metaphysical term, has been defined as the essence of the thing from which result not only its figure and shape, but all its other qualities. Hence it is all that makes a thing intelligible to the mind, in contradistinction to *matter*, thus regarded as a kind of unknown substance or substratum.

Formaldehyde (for-mal'dē-hīd), or FORMIC ALDEHYDE, is a colorless, pungent, irritating gaseous body (CH_2O), with characteristic odor and very decided antiseptic and bactericidal properties. It is the best bactericide known, acting effectively in the gaseous state. It was first produced by Hofmann in 1868. It is made by the action of heat on wood alcohol, being an oxidation product. It is very irritating to the mucous membrane of the eyes and nose, inflammation resulting after much inhalation of it. It is used by Boards of Health, being sprinkled or poured on the floor of a room, all outlets being fastened so as to keep the gas confined therein. Thus used, it acts as a disinfectant, destroying disease germs. The odor may be removed afterwards by ammonia, which is sprinkled about the apartment. It is also used to harden and preserve pathological and histological specimens, etc. It is made and used internally as hexamethylenamin, etc., much diluted with water, in some forms of cystitis, etc.

Formation (for-mā'shun), in geology, any series of rocks referred to a common origin or period, whether they consist of the same or different materials. Geological strata are divided into certain groups of one era of deposition, sometimes of very dissimilar mineralogical character, but enclosing the same fossil species; as, the

Carboniferous, Oolitic, Cretaceous, Silurian, Laurentian, etc., *formations*. See *Geology*.

Formentera (for-men-tē'ra), one of the Balearic Islands, about 12 miles long and 8 broad, hilly, woody, and but little cultivated.

Formica (for'mi-ka), the genus to which some of the ants belong.

Formic Acid (for'mik; CH_2O_2), an acid obtained from ants (L. *formica*, an ant), when repeated quantities of them have been infused in boiling water. It is contained in human sweat and urine, in the common nettle and other plants, and may be prepared artificially in various ways. It is a colorless, volatile liquid, with pungent odor, and producing intense irritation on the skin.

Formosa (for-mō'sa), an island in the Chinese Sea, separated from the Chinese prov. of Fokien by a strait about 80 miles wide where narrowest. The island is about 250 miles in length and 70 in average breadth. It is divided by a central range of mountains (rising to 12,000 feet) into a western and eastern part, the former of which (mostly a plain) is occupied by about 500,000 immigrant Chinese, and highly cultivated, producing in abundance corn, rice, sugar, pepper, camphor, oranges, bananas, etc. The eastern part is inhabited mainly by wild tribes of Malayan race, who are gradually disappearing before the Chinese. Northern Formosa is volcanic, and earthquakes occur. Four ports have been open since 1860 to European commerce: Tai-wan (the capital), Tam-sui, Ke-lung, and Takow; and the trade of the island since then has greatly increased. The chief exports are coal, tea, camphor, sugar, indigo, hemp, timber; this island being the principal source of camphor. The imports are cotton and woolen goods and opium. It formerly belonged to China, but was ceded to Japan in 1895, in consequence of the war with China. Japan has had much trouble with the wild tribes and is making vigorous effort to bring them under control.

Formo'sa, an island in the Atlantic, forming one of the Bissagos off the west coast of Africa. See *Bissagos*.

Formula (for'mū-la), a fixed form of words or symbols. In theology it is a formal statement of doctrines; in mathematics, a general theorem, a rule or principle expressed in algebraic symbols. In chemistry it is a mode of expressing the constituents of a compound by means of symbols and letters. Thus water is represented by H_2O, in which H_2 stands for the two proportions of hydrogen and O for the one of oxygen which are combined to produce water. In medicine it signifies a prescription.

Forres (for'es), a burgh of Scotland, county of Elgin, beautifully situated in a finely-wooded country. Forres Castle was the residence of the early Scottish kings, and Shakespere has made this neighborhood the scene of the chief events in *Macbeth*. Pop. 5242.

Forrest (for'est), EDWIN, actor, born in Philadelphia in 1806. He showed an early talent for the stage, and in 1820 made his début at Philadelphia as the hero in Home's play of *Douglas*. In 1826 he appeared before the New York public as *Othello* with signal success. In 1836 he visited England, making a third and last visit in 1845. He continued to act with great success at New York till 1871, when he retired, dying in 1872. His chief characters were *Othello*, *Macbeth*, *Hamlet*, and *Richard III*. His former abode in Philadelphia is now the home of the Philadelphia School of Design for Women, and he established by will a home for aged and infirm actors, near that city.

Forrest, NATHAN BEDFORD, Confederate cavalry commander; born in Tennessee in 1821. He was a slave trader in Memphis, Tennessee, and at the outbreak of the Civil war joined the Confederate Army as a private, becoming a daring commander of cavalry and attaining the rank of lieutenant-general. He was one of the ablest cavalry leaders in the war. His name became notorious in connection with the Fort Pillow Massacre, although he always denied the charge that no quarter was allowed. He died in 1877.

Forster (fors'ter), JOHANN GEORG ADAM, a German traveler, son of Johann Reinhold Forster, was born in 1754. He accompanied his father to Russia and England, and both accompanied Cook in his voyage round the world 1772-75. Subsequently he taught natural history at Cassel, held a professorial chair at Wilna, became librarian to the Elector of Mainz, and died at Paris in 1794. An excellent account of Cook's second voyage round the world was written by him in connection with his father. He also wrote *Essays on Geography, Natural History, Views of the Lower Rhine*, etc.

Forster, JOHANN REINHOLD, a German writer, father of the foregoing, born in 1729. He studied

theology at Halle, and became preacher at Nassenhuben. He chiefly devoted himself, however, to his favorite studies —mathematics, history, geography, etc. After having been engaged on a mission by the Russian government he in 1766 migrated to London, where he supported himself and his son, Johann Georg, partly by teaching. He was finally invited to accompany Captain Cook in his second voyage as naturalist of the expedition. An account of the voyage was published in his son's name (London, 1777). In 1780 he was invited to Halle as professor of natural history, and continued there until his death in 1798.

Forster, JOHN, an English writer, born at Newcastle in 1812. While studying for the bar in London he contributed to the *Examiner* and other periodicals. In 1843 he was called to the bar, but his main interests remained in the field of literature. He became editor of the *Daily News* in 1846, and shortly afterwards of the *Examiner*. In 1848 he published his *Life of Goldsmith*. In 1856 he retired from the editorship of the *Examiner*, having been appointed the year previous secretary to the Lunacy Commission, of which he became in 1861 a commissioner. During this period he devoted himself to historical studies, the result of which appeared in his *Arrest of the Five Members, Debates on the Grand Remonstrance*, and *Life of Sir John Eliot*. He also published biographies of Landor and Dickens, but died in 1876, before completing his *Life of Swift*.

Forster, WILLIAM EDWARD, an English statesman, born at Bradpole, Dorset, in 1818, the son of an eminent minister of the Society of Friends. He entered into the woolen trade at Bradford. In 1850 he married the eldest daughter of Dr. Arnold, of Rugby. He was returned to Parliament for Bradford in 1861; became successively under-secretary for the colonies, vice-president of the Education Committee and a member of the cabinet. He had charge of the Education Bill of 1870 and the Ballot Bill of 1872. In 1875, the Liberals having just returned to power, Mr. Forster accepted the post of chief secretary for Ireland at a time when that country was distracted by agrarian and political tumults. The suppression of the Land League and the arrest of Mr. Parnell and the more violent agitators was carried out by Mr. Forster, but on the government resolving to change its policy and release the Parnellites Mr. Forster resigned (1882). After this he was often found voting in opposition to the government, particularly in matters of foreign and imperial policy. He died in 1886.

Forsyth (for-sith'), WILLIAM, an English lawyer and writer, born in 1812. After a brilliant career at Trinity College, Cambridge, he studied law, was called to the bar in 1839, and became a queen's counsel in 1859. He represented the borough of Marylebone in the House of Commons in 1874-80. Besides legal works he wrote *Hortensius, or the Duty and Office of an Advocate; History of Trial by Jury; Napoleon at St. Helena and Sir Hudson Lowe; Life of Cicero; Novels and Novelists of the Eighteenth Century; Hannibal in Italy*, a drama, etc.; and contributed to periodicals. Died in 1899.

Fort (fôrt), a small fortified place surrounded with a ditch, rampart, and parapet, for the purpose of defending a pass, river, road, harbor, etc. Forts are made of different forms and extent according to the exigencies of the case. See *Fortification*.

Fort Collins, a city, capital of Larimer County, Colorado, on Cache la Poudre Creek, 74 miles N. of Denver. It is the seat of the Colorado Agricultural College and of a government experiment station. Nearby are large cattle and sheep ranges, and it has a large beet-sugar factory. Pop. 10,000.

Fort de France, or FORT ROYAL, a town and seaport of the French West Indies, island of Martinique, of which it is the capital. It was almost completely destroyed by a cyclone in 1891. Pop. about 14,000.

Fort Dodge, a city, capital of Webster County, Iowa, on the Des Moines River, 85 miles N. W. of Des Moines. Nearby are coal mines and beds of gypsum and clay. The manufactures include gypsum products, clay wares, shoes, clothing. It is an important grain market. Pop. 15,543.

Forth (fôrth), a river of Central Scotland, formed in Perthshire by the junction of two streams, the Duchray and the Dhu, about 1 mile W. of Aberfoyle. From Aberfoyle the river flows southeast, forming for a considerable part of its course the boundary between the counties of Stirling and Perth, winding in its lower course in a series of curves known as the *Links of Forth*, and expanding thereafter into the *Firth of Forth*, which forms the most important harbor of refuge N. of the Humber.

Forth Bridge, the great railway viaduct which crosses the Firth of Forth at Queens-

ferry, here about 4000 feet wide at low water. The small island of Inchgarvie is used as the central support of the two chief spans, which are 1710 feet wide each. These spans are each made up of two cantilevers extending towards each other from the opposite sides and connected by a girder, the cantilevers being 343 feet deep where they rest on the supporting piers and 40 feet at the free ends, and projecting 680 feet, while the central connecting girder is 350 feet in length. There are other two spans of 680 feet each, fifteen of 168 feet each, and seven small arches totaling about 400 feet. Including piers there is about a mile of main spans and over half a mile of viaduct approach. The bridge has a clear headway of 157 feet above high water and carries two lines of rails. It was built 1882–89, the contract price being $8,000,000.

Section through Line of Fortifications.

Fortification (for-ti-fi-kā'shun), the science of strengthening positions in such a way that they may be defended by a body of men much inferior in number to those by whom they are attacked; and more particularly, the science of strengthening positions so that they may be held against the assault of troops supported by artillery. Fortifications are usually divided into permanent and temporary. Permanent fortifications are works required to remain effective for any length of time, for the purpose of defending important positions and cities, dockyards, arsenals, etc. Temporary fortifications are such as are designed merely to throw temporary obstacles in the way of the enemy, as fieldworks, etc. The former are constructed on the principle that each part must by its fire support and be supported by some other part; that the works must protect the defenders from the enemy's fire as well as possible, and that the fire of the fortress must completely sweep all parts of the ground in front of the fortified lines. The more important details of a regular fortification may be briefly described as under: Around the place to be defended is raised a mound or bank of earth called a rampart, on the upper surface of which, the *terre-pleine* (*a*), the troops and cannon are placed. The terre-pleine is protected from the enemy's fire by a breastwork or *parapet* (*b*), about 8 feet high, sometimes pierced at certain intervals with *embrasures* through which the guns are fired. Beyond the rampart is the *ditch*, usually about 12 feet in depth, but varying greatly in width. The ditch is sometimes filled with water; in other cases it is dry. The *scarp* or *escarp* (*c*) is the inner wall of the ditch, and it is faced with mason-work or hurdles, sods, etc. (the *revetement*) to retain the earth of the rampart in its place. The *counterscarp* (*d*) is the opposite or outer wall of the ditch. From the top of the counterscarp outwards is a space about 30 feet wide (the *covered-way*, *e*) protected by a parapet, the long superior outward slope of which towards the open ground forms the *glacis*. The use of the covered-way is to allow the troops to be drawn up on it unseen by the besiegers for the purpose of making a sortie, it also enables the defenders to keep up a closer fire on the attacking forces. The slope of the glacis is so constructed as to bring the assailants in the direct line of fire from the artillery on the ramparts. In the sectional cut A is towards the interior of the fort, B towards the open country. At certain intervals there are often bastions or projecting works at salient angles, commanding by their fire the *curtain* or straight portion of the fortified line between them. The use of the bastion has given name to what is called the *bastionary* system of fortification, which has in modern times largely given way to what is known as the *polygonal* or German system, which is considered to have various advantages in relation to the powerful artillery of the present day. The polygonal system has also been called the *caponier* system, from the use of powerful casemated caponiers constructed across the ditches and serving instead of bastions for their defense. The general plan of the works is polygonal, with the ramparts placed on the sides of the polygon. The connecting line of fortifications, surrounding a place is called the fortified *enceinte*, and the works in a regular fortress form a very complicated whole, including works to which such names as *ravelins*, *demi-*

lunes, etc., are given. The fortified enceinte immediately surrounding a place is not now considered a sufficient defense, on account mainly of the long range of modern cannon. Hence it is usual to surround a fortress with a line of detached forts at some distance from the enceinte, or there may be more than one such line of advanced works. Fortifications intended to ward off attacks by sea have their sea-faces now commonly protected by plates of iron or steel. Scientific fortification may be said to commence with the great French engineer Vauban, who served under Louis XIV. He developed the bastioned system, which, as improved by Cormontaigne and others, is still the prevailing type of French fortification.

Field Fortifications vary much according to the time allowed for construction and during which they may prove useful. Amongst works of this nature are the *redan*, which consists of two parapets, with a ditch in front, forming an angle facing the enemy; the *lunette*, which is a redan with short flanks; the *redoubt*, a closed work with a ditch and parapet all round. As none of those works has a flanking fire in itself, they have to be disposed so that they flank each other within rifle range. To do this effectually, and to strengthen the whole line, the plan generally adopted is to form an intrenched camp by a line of square redoubts, flanking each other, and also a line of simple redans in front of the intervals of the redoubts. When the time is not sufficient to throw up such works, simple forms of intrenchments, such as shelter trenches, are used to shelter troops or oppose the enemy's advance. A very shallow trench, with the earth thrown to the front, so as to afford shelter to one man lying in it, may be made in somewhat less than half an hour; more elaborate forms in about one hour. So that by placing a man at every 4 feet, active troops can make good shelter for themselves in an hour. To impede the enemy's advance an abattis of felled trees may be used, also wire entanglements, chevaux-de-frise, etc.

Fort Madison, a city, capital of Lee Co., Iowa, on the Mississippi River, 24 miles above Keokuk. It has a state penitentiary, iron, lumber, and paper mills, etc. Pop. 8900.

Fortress Monroe, Old Point Comfort, Virginia, defending, with Fort Wool, Hampton Roads, Norfolk, and the Gosport navy yard. It contains barracks, a school of artillery, and arsenal. It is an irregular hexagon, surrounded by a tidewater ditch eight feet deep, and covers eighty acres. It was commenced in 1817.

Fort Scott, a city, county seat of Bourbon Co., Kansas, 99 miles S. of Kansas City. It has an active business in flour, iron, pottery, overall and other manufactures. It is in a coal region, the mining and shipping of bituminous coal constituting a large business. It has also an extensive supply trade. Here is located the Kansas Normal College. Pop. 11,793.

Fort Smith, county seat of Sebastian Co., Arkansas, at the confluence of the Arkansas and Potean rivers, served by five railroads. It is in the heart of rich coal and gas fields, and has many industries, including wagon and furniture factories, wood-working establishments, brick factories, ironworks, etc. It is also an important wholesale and jobbing point. Pop. 30,000.

Fort Sumter, a fort on the entrance to Charleston Harbor, South Carolina. At the opening of the War of Secession it was taken by the Confederates from the small body of Federal troops by whom it was garrisoned (14 April, 1861). It repulsed an attack of nine iron-clads on 7 April, 1863, and was heavily bombarded in August of the same year, but maintained its defense till the final evacuation of Charleston, Feb. 18, 1865. It has been rebuilt on a modified plan.

Fortuna (for-tō'na), the Roman goddess of success, corresponding to the Greek *Tychē*. She is generally delineated with a rudder, emblem of her guiding power; or, later, with a bandage over her eyes and a scepter in her hand, and sitting or standing on a wheel or globe.

Fortunate Islands, an old name of the Canaries.

Fortunatus (for-tū-nā'tus), the hero of an old popular legend. He obtained a wishing-cap and inexhaustible purse of gold, which finally ruined him and his sons. The first printed edition of the story appeared in Germany in 1509, but in various forms it has appeared in most of the languages of Europe.

Fortunatus, a Latin poet, born in Northern Italy about 503 A.D.; Bishop of Poitiers in 597; died about 600. His works were numerous, but he is remembered only by his hymns, one of which (*Vexilla regis prodeunt*) was adopted by the church, and is well known in the modern version of J. M. Neale ('The royal banners forward go,' etc.).

Fortuny (for-tō'nē), MARIANO, a Spanish painter, born near Barcelona in 1839. He settled at Rome, where he became the center of a school of artists in revolt against overstudy of the 'masters.' In 1866 he went to Paris. Among his best known works are *Spanish Marriage*, *Fantasia at Morocco*, *The Academicians at Arcadia*, *The Seashore at Portici*. Died 1874.

Fort Wayne, a flourishing city of Indiana, capital of Allen Co., situated at the junction of the St. Mary's and St. Joseph's Rivers, which here unite to form the Maumee. It has extensive railroad shops, car-wheel works, hosiery mills, and electrical machinery works, with many other industries. Here are Concordia College and other educational institutions. Fort Wayne derives its name from a fort erected here in 1794 by General Anthony Wayne. Pop. 78,547.

Fort William, a port and summer resort of Ontario, Canada, on Thunder Bay, at head of navigation on Lake Superior; the lake terminus of the Canadian Pacific railway; also served by the Grand Trunk and Canadian Northern. It has grain elevators, iron and stove works, flour mills, and manufactures of hardwood floors, cars, bricks, aerated water, etc. Pop. 30,000.

Fort William, a town of Scotland, county of Inverness, at the foot of Ben Nevis, near the south end of the Caledonian Canal.

Fort Worth, a city, county seat of Tarrant Co., Texas, 160 miles N. of Austin, with 17 railroad outlets. Here are numerous industries, including grain elevators, and flour mills, packing houses, furniture-making, woodworking, etc. It is the seat of Polytechnic College, Texas Christian University, and other institutions. Pop. 73,312.

Forum (fō'rum), among the Romans, any open place where the markets and courts of justice were held. There were a number of such places in Rome, by far the most celebrated being the great Roman forum (*Forum Romānum*) between Mount Palatine and the Capitoline Hill. This place, once adorned with the most beautiful statues and buildings, had become almost a waste known as the *Campo Vaccino*, or cattle-field, but of late years the government has made clearances and excavations and taken charge of the valuable relics which are still left.

Foscari (fos'kä-rē), FRANCESCO, Doge of Venice, born about 1372, elected in 1423. The whole period in which he governed the republic was one of war and tumult, campaigns being undertaken against the Turks, the Visconte of Milan, and others, in which Venice was mostly victorious, extending her dominion to the Adda. But in his private life the doge was less fortunate. Three of his sons died in the service of the republic, and the fourth, Jacopo, being accused of receiving bribes from foreign princes, was condemned to torture and exiled to Crete, where he died. When eighty-five years of age Foscari was deposed from the dogeship at the instigation of a rival, Jacopo Loredano, and died a few days after, November 1, 1457. On the story of Jacopo Foscari is founded Byron's tragedy of *The Two Foscari*.

Foscolo (fos'ko-lō), UGO, an Italian poet and prose writer, born about 1776, and educated at the University of Padua. Before the age of twenty he produced his tragedy *Il Tieste* ('Thyestes'), which was received with applause. His next work of importance was a romance somewhat in the style of Goethe's *Werther*, called *Ultime Lettere di Jacopo Ortis* ('Last Letters of Jacopo Ortis'). He then procured a commission in the army (First Italian Legion). After some military experiences under Masséna at Genoa and elsewhere, in 1806, he retired and wrote *I Sepolcri*, one of the finest of his poems. He was subsequently appointed to a professorship at Pavia, of which Napoleon, displeased at his freedom of speech, soon deprived him. In 1812 he produced his tragedy of *Ajax*, and soon after that of *Riccarda*. On the fall of Napoleon, Foscolo, who was obnoxious to the Austrians, retired to Switzerland; but finally, in 1815, went to London, where he met with a most favorable reception, and where he died in 1827. Besides the works already mentioned, his critical writings, *Essays on Petrarch* and *Discourses* on the texts of Dante and of Machiavelli's *Il Principe*, are well known.

Foss, or FOSSE (French *fosse*, Latin *fossa*, a ditch), in fortification, a trench or ditch, often full of water, below the rampart of a fortified place, or a post that is to be defended. See *Fortification*.

Fossano (fōs-sä'nō), a town in North Italy, on the Stura, 13 miles northeast of Cuneo. It is surrounded by old walls and defended by a castle. It is a bishop's see and has a cathedral. Pop. of commune, 18,175.

Fosse Way, or FOSSE ROAD, one of the great Roman roads from Cornwall by Bath, Coventry, and Leicester, to Lincoln. It is still traceable nearly all the way.

Fossil (fos'il), a term for the petrified forms of plants and animals which occur in the strata that compose the surface of our globe. Most of these fossil species, many of the genera, and some of the families are extinct. When these remains are only partially fossilized, and occur in superficial or recent deposits, the term *subfossil* is employed. See *Geology* and *Palæontology*.

Fossil Footprints, the footmarks or imprints left at very remote periods by the feet of various animals on the wet clay or sand of sea-beaches or similar localities, and which are now found at various levels in the solid strata of the earth. The footprints in the Silurian and other very antique rocks are mostly those produced by the claws of crustaceans. In the Triassic rocks of Connecticut, numerous footprints have been found, over forty species being represented.

Fossil Forests. The coal measures present abundant indications of ancient forests, usually in the form of the roots of the trees from which the coal was formed. Several such have been uncovered, as in the coalfields of Nova Scotia, where Lyell found the remains of trees 6 to 8 feet high, and one tree about 25 feet high and 4 feet in diameter. At St. Etienne, near Lyons, France, the remains of a fossil forest have been found in an upright position, and in a colliery near Wolverhampton, England, in a space about one-fourth of an acre, have been found the fossilized stumps of 73 trees, with roots attached, and with the broken-off trunks lying prostrate, one of them 30 feet long and all of them turned into coal. Much more recent are the remains of forests lying under beds of peat, 'submerged forests,' as they are called, found in various parts of Europe and America. Especially interesting are the collections of fossilized tree trunks, or 'petrified forests,' found in the surface in various parts of the earth, the most striking examples being in the western part of the United States. A remarkable group of such trees, some of them 12 feet in diameter, exists in Nana County, California, and another in Yellowstone Park, in which the trees are still erect, though converted into stone. An extraordinary forest of such trees has been found in Arizona, lying over a wide space of ground, some of them 6 feet in diameter and perfectly preserved. These trees are rather mineralized than fossilized. They are found in volcanic regions and are supposed to be due to the action of hot water, which carried off the organic material and deposited dissolved silica in its place. In some instances the wood has been converted into solid jasper or has been changed into opal or agate, or filled with chalcedony or crystallized quartz, with beautifully variegated colors.

Fossombrone (f o s - s o m-brō'nā), a town of Central Italy, 38 miles W. N. W. of Ancona, on the Metauro, with a fine cathedral. Pop. (commune) 10,847.

Foster (fos'tėr), BIRKET, an English artist, born at North Shields in 1812. He learned wood-engraving under Landells, and in early life became a draughtsman. He soon achieved a high reputation as a book illustrator, and illustrated the works of Goldsmith, Scott, Longfellow, Beattie, etc. His landscape drawings on wood are of great excellence. He afterwards devoted himself to water-color painting, in which his reproductions of rustic life were very successful. Died in 1899.

Foster, JOHN, an English essayist, was born in Yorkshire in 1770. After a short trial of the weaving trade he studied for the Baptist ministry, obtained a charge at Newcastle-on-Tyne, but his preaching being unsuccessful, he took to literature, contributing extensively to the *Eclectic Review*. In 1805 he published four essays, very celebrated in their time, which established his fame as an author. In 1819 the celebrated *Essay on the Evils of Popular Ignorance* appeared. He died in 1843.

Foster, JOHN WATSON, diplomatist, born in Pike Co., Indiana, in 1836. He served with distinction in the Civil War, and was afterwards editor of the Evansville (Ind.) *Daily Journal*. His diplomatic career began in 1873, when he was sent as Minister to Mexico. Thence he went to Russia in 1880, and to Spain in 1883, and in 1891 was engaged in negotiating reciprocity treaties with Spain, Germany and Brazil. He was Secretary of State under President Harrison in 1892-93. He was subsequently engaged in various diplomatic services, the latest being as a member of the Alaska Boundary Tribunal of 1903, and as the representative of China to the Second Hague Conference, 1907.

Foster, STEPHEN COLLINS, s o n g-w r i t e r, born at Pittsburgh, Pennsylvania, in 1826; died in 1864. He was very prolific in musical composition, writing the words and composing the music of over 125 popular songs and melodies. Among them are the well-known airs, *My Old Kentucky Home; Old Folks at Home; Willie, We Have Missed You; Old Black Joe; Uncle Ned*, etc.

Fostoria (fos-tō'ri-a), a city of Ohio, lies in Seneca, Hancock, and Wood Counties, 12 miles N. W. of Tiffin. It is a considerable railroad and manufacturing center, having five railroads. Natural gas is abundant, and is used for manufacturing and domestic purposes, flour, glass, barrels, etc., being produced. Here is the Ohio Normal University. Pop. 9597.

Fotheringhay (fo-ther-ing'hay), a village of England 27 miles northeast of Northampton. In its castle Mary Queen of Scots was beheaded in 1587.

Foucault (fö-kō), JEAN BERNARD LÉON, a French physicist, born 1819; died 1868. His name is especially connected with a celebrated pendulum experiment employed as a method of showing the rotation of the earth on its axis, by observing a vibrating pendulum. He also rendered services to optics, electric lighting, photography, etc.

Fouché (fö-shā), JOSEPH, Duke of Otranto, a minister of Napoleon I, was born in 1763. He was at first educated for the clergy, but having adopted the principles of the revolution he became an advocate and was elected a member of the National Convention in 1792. Here he voted for the death of the king, and was implicated, at least nominally, in the atrocities of the period. On the fall of Robespierre (1794), Fouché, who had for some time tended towards the moderate party, managed to make friends with Barras, and was rewarded for his betrayal by the ambassadorship to Milan. He was afterwards appointed ambassador to Holland, but ultimately recalled to Paris and made minister of police. Here his peculiar talents had full scope; and although he was twice dismissed by Napoleon, who did not altogether trust him, he always recovered his post, was loaded with riches, and made Duke of Otranto. He was minister of police at Napoleon's final abdication and played an important part in the arrangements. He remained in office under Louis XVIII for a time, but the dislike of the royalist party at length forced him to resign (1815). He went as ambassador to Dresden, but afterwards retired to Prague, and latterly to Trieste, where he died in 1820.

Fougasse (fö-gâs'), military, a little mine in the form of a well, 8 or 10 feet wide and 10 or 12 deep, dug under some work, fortification, or post, charged with powder, or powder and shells, and covered with stones or earth, for destroying the works by explosion.

Fougères (fö-zhâr), a town of N. E. France, dep. Ille-et-Vilaine, on a height, 28 miles N. E. of Rennes. It was once fortified, so as to be considered one of the keys of Brittany, but is now open, well built, and has manufacturers of flannels, sailcloth, sacking, etc. Pop. (1906) 21,847.

Foula (fou'la), an island belonging to the Shetland group, but lying some 20 miles to the west. It rises from the sea in lofty cliffs, which swarm with sea-fowl.

Foulahs. See *Fellatahs.*

Foundation (foun-dā'shun), that part of a building which is underground, or the portion of the ground on which walls, piers, etc., rest. Foundations are usually made by providing a hard, impermeable base for the masonry by methods which vary according to the position and soil. Where there is rock beneath, nothing more is needed than a dressing for the surface. Submerged foundations, such as those needed for breakwaters, bridges, etc., constitute special subjects for engineering science.

Foundation, a donation or legacy, in money or lands, for the maintenance or support of some useful charitable institution, as an hospital, a college, a school, etc.

Foundation-stone, a stone of a public building laid in public with some ceremony. It has no necessary connection with the foundation of the building. Also called corner-stone.

Founding. See *Casting.*

Foundling Hospitals (found'ling), institutions for receiving children abandoned by their parents and found by strangers. Among such institutions are that of Paris, instituted in 1670, and that of London in 1739. The latter was originally a hospital for all exposed children; but the enormous increase in abandonments caused the hospital to be changed in 1760 to one for poor, illegitimate children whose mothers are known. The objection that foundling hospitals contribute to the corruption of morals is the strongest which can be urged against such institutions, and is not easily answered.

Foundry (foun'dri), a place where metal is melted and cast into the forms required in construction or decoration. Iron, brass, bronze, and type founding are special forms of the art. See *Casting.*

Fount, or FONT, among printers, etc., a quantity of types, in proportions sorted for use, that includes ordinary letters, large and small capitals, single letters, double letters, points, commas, lines, numerals, etc.; as a fount of pica, bourgeois, etc. A fount of 100,000 characters, which is a common fount, would contain 5000 types of *a*, 3000 of *c*, 11,000 of *e*, 6000 of *i*, 3000 of *m*, and about 30 or 40 of *k*, *x*, *y*, and *z*. But this is to be understood only of the ordinary types, capitals having other proportions, which we need not here enumerate.

Fountain (foun'tan), a contrivance by which water is made to spout from an artificial channel, and often to rise up to a great height in a jet or jets. There are various kinds of artificial fountains, but in those of an ornamental character the water is usually made to rise in a jet by the pressure or weight of a head of water situated some distance above the orifice of issue, in which case the water will rise nearly to the same height as the head. In some cities the public fountains form a feature on the streets. Rome, in particular, is noted for its fountains. At Paris, also, the fountains of the Place de la Concorde, the Tuileries, and at Versailles, are splendid structures.

Fouqué (fō-kā), FRIEDRICH HEINRICH KARL, Baron de la Motte, a German poet and novelist, born in 1777, grandson of the Fouqué the subject of the next article. He served as lieutenant of the Prussian guards in the campaign of 1792, thereafter lived in rural retirement, but again returned to the army, and was present at the most important battles in the campaign of 1813. He died at Berlin in 1843. As a writer his work is marked by fantastic unreality and extravagance of conception. Several of his tales, *Der Zauberring* ('Magic Ring'), *Undine*, and *Aslauga's Ritter* ('Aslauga's Knight'), have been very popular. A translation of the latter was made by Carlyle.

Fouqué, HEINRICH AUGUST, Baron de la Motte, a distinguished Prussian general in the Seven Years' war, born in 1698; died in 1774. He was descended from an old Norman family which had fled on account of religious persecutions to The Hague. Fouqué's *Mémoires*, containing his correspondence with Frederick the Great, are highly interesting.

Fouquier-Tinville (fō-ki-ā-tan-vēl), ANTOINE QUENTIN, notorious for his ferocious cruelty in the first French revolution, was born in 1747. He was an attorney by profession, and having attracted the attention of Robespierre, was appointed public accuser before the revolutionary tribunal. His thirst for blood seems to have been increased by gratification, until it became a real insanity. He proposed the execution of Robespierre and all the members of the revolutionary tribunal in 1794, but was himself arrested, and died under the guillotine, in a cowardly manner, in 1795.

Fourchambault (fōr-shân-bō), a town of France, dep. Nièvre, on the Loire. It has extensive iron-smelting furnaces and forges. Pop. (1906) 4591.

Fourcroy (fōr-krwä), ANTOINE FRANÇOIS DE, a French chemist, born in 1755. Having adopted the profession of medicine, he applied himself closely to the sciences connected with it, and especially to chemistry. In 1784 he was made professor of chemistry at the Jardin du Roi; and the next year he was chosen a member of the Academy of Sciences. At this period he became associated with Lavoisier, Guyton-Morveau, and Berthollet in researches which led to vast improvements and discoveries in chemistry. When the revolution took place he was chosen a deputy from Paris to the national convention, but did not take his seat in that assembly till after the fall of Robespierre. In September, 1794, he became a member of the committee of public safety. In December, 1799, Bonaparte gave him a place in the council of state, in the section of the interior, in which place he drew up a plan for a system of public instruction, which, with some alteration, was adopted. He died in 1809. His works are numerous. We may mention his *Système des Connaissances chimiques* and *Philosophie chimique*.

Fourier (fō-ri-ā), FRANÇOIS MARIE CHARLES, a French socialist and founder of the system named after him, was born in 1772 at Besançon. He studied in the college of his native town, and subsequently at Rouen and Lyons occupied subordinate situations in mercantile houses. In the last-mentioned town he entered into business on his own account, but lost all his money from the tumults of war and was forced to enlist in the revolutionary army. Discharged in 1795 on account of ill health, he returned to commerce, filling quite subordinate situations, till he died in 1837. He wrote his books in his leisure hours and published them out of his scanty savings. His first book, *Théorie des Quatre Mouvements et des Destinées Générales*,

was published in 1808; the *Traité de l'Association Domestique Agricole*, his most important work, in 1822; but it was not till the last years of his life that they attracted any notice. In his social system Fourier holds that the operations of industry should be carried on by *Phalansteries*, or associations of 1800 members combining their labor on a district of about a square league in extent, under the control of governors elected by each community. In the distribution a certain minimum is first assigned for the subsistence of every member of the society, whether capable or not of labor. The remainder of the produce is shared in certain proportions to be previously determined among the three elements, labor, capital, and talent. The capital of the community may be owned in unequal shares by different members, who would in that case receive, as in any other joint-stock concern, proportional dividends. The claim of each person on the share of the produce apportioned to talent is estimated by the grade which the individual occupies in the several groups of laborers to which he or she belongs, these grades being in every case conferred by the voice of his or her companions. The remuneration received would not of necessity be expended in common. Separate rooms or sets of rooms would be set aside for those who applied for them, no other system of living together being contemplated than such as would effect a saving of labor in building and the processes of domestic life, and reducing the enormous portion of the produce of industry at present carried off by middlemen and distributing traders to the narrowest possible margin.

Fourier, JEAN BAPTISTE JOSEPH, a French mathematician, born at Auxerre 1768, was educated in the military school there, and after holding an appointment for a short time in the Polytechnic School followed Bonaparte to Egypt. Here he performed important political service, and was likewise secretary of the Institute of Egypt. After his return he was, in 1802, appointed prefect of the department of Isère. On Napoleon's return from Elba Fourier issued a royalist proclamation, but was nevertheless appointed prefect of the Rhone, though soon after deprived of the office. He now established his residence in Paris, lived entirely devoted to study, and was in 1815 admitted a member of the Academy of Sciences, and at a later period appointed secretary for life. He died in 1830. Amongst his principal works are the *Théorie Analytique de la Chaleur* (1822), and *Analyse des Equations Determinées*, published in 1831 after his death.

Fourierism. See *Fourier (François)*.

Fourier Series, infinite series of special type, named after Fourier, who first showed their importance. They proceed according to sines and cosines of multiples of a variable, the various multiples being in the ratio of the natural numbers; and are used for the representation of a function of the variable for values of the variable which lie between prescribed finite limits.

In the discussion of all complex periodic phenomena, such as tidal flow and ebb, earthquake frequency, the penetration of solar heat into the crust of the earth, etc., the true method of attack is along the lines of the Fourier analysis.

Fourth (fōrth), in music, a distance comprising three diatonic intervals, or two tones and a half. Three full tones compose a tritone or fourth redundant. The diminished fourth consists of a whole tone and two semi-tones.

Foveaux Strait (fō'vō), the strait between the South Island of New Zealand and Stewart's Island.

Fowey (fō'i), a seaport of England in Cornwall, near the mouth of the river Fowey, formerly one of the chief seaports of England. It carries on an extensive pilchard fishery. Pop. 2258.

Fowl (foul), a word originally synonymous with *bird*, now used in a stricter sense to designate the birds of the genus *Gallus*, of which the common domestic fowl (cock and hen) is a familiar example. The general form and characters of the bill, feet, etc., agree with those of the pheasants, but the crown of the head is generally naked and furnished with a fleshy comb, the base of the lower mandibles also bearing fleshy lobes or wattles—characters which are most conspicuous in the males. The legs of the male are furnished with spurs which are much used in conflict, the cocks being very pugnacious and unable to suffer the presence of a rival. In the center of the cock's tail are two long feathers, which fall backwards in a graceful arch and add great beauty to the whole aspect of the fowl. Except in the pure white breeds the plumage of the cock is always more splendid than that of the hen. All the species are natives of the East Indies and the Malayan Archipelago. Some have thought that the *bankiva jungle fowl*, a native of Java, is the original stock of of the domesticated poultry. Fowls were introduced into China about 1400 B. C., and were common in ancient Greece, being mentioned by Aristophanes and others.

Fowling, the taking of wild birds in numbers, either for food or for their feathers. It includes a variety of methods, such as the catching of small birds by nets; the taking of ducks and other water-fowl in decoys; the lowering of persons over the brink of precipices to seize the birds that lodge in their hollows and shelves, etc.

Fowling Piece, a light kind of gun for shooting birds of various kinds.

Fox (foks), an animal of the genus *Vulpes*, closely allied to the dog, with a straight, bushy tail, elongated pupils, and erect ears. Foxes are natives of almost every quarter of the globe, and are everywhere among the most sagacious and wily of all beasts of prey. very voracious, devouring birds and small quadrupeds, and committing ravages not only on animals, but on fruits, honey, eggs, etc. The common fox of Europe (*Vulpes vulgāris*) and Asia is well known. Among other species there are the Arctic fox (*V. lagōpus*), celebrated for its glossy white winter fur; the *black fox* (*V. argentātus*), similar to the common fox, but distinguishable by its rich, shining black fur, a native of the northern parts of Asia and America; the *gray fox* (*Urocyon Virginiānus*) has a thick tail containing at its tip a tuft of stiff hairs, common through the northern parts of America; the *red fox* of America (*V. fulvus*), generally of a pale-yellow hue; the *crossed fox* (*V. Pennsylvanicus* or *decussātus*), fur a sort of gray, muzzle and lower parts of body black, a dark cross on the shoulders; the *swift fox* (*V. velox*), an inhabitant of the plains which lie at the base of the Rocky Mountains.

Fox, CHARLES JAMES, an eminent English statesman, born in 1749, the second son of Henry, first Lord Holland. He was sent to Eton, whence he removed to Hertford College, Oxford. His father procured him a seat for the borough of Midhurst in 1768, before he was of legal age, and in 1770 he was appointed one of the lords of the admiralty, which situation he resigned in 1772, and was appointed a commissioner of the treasury. After being a supporter of the administration for six years, a quarrel with Lord North threw Fox into the ranks of the Whig opposition, where, along with Burke and others, he steadily assailed the government, especially on the score of its American policy. In 1780 he was elected member for Westminster, and on the defeat of the administration of Lord North, and the accession of that of the Marquis of Rockingham, he obtained the office of secretary of state for foreign affairs (1782). But the death of the Marquis of Rockingham suddenly divided the party; and when the Earl of Shelburne became first lord of the treasury Fox retired. Soon after a union took place between his friends and those of Lord North, known as *the coalition ministry*, which was overthrown by Fox's famous East India Bill (1783). At the ensuing election nearly seventy of his friends lost their seats; but though Pitt had a decided majority, Fox still headed a very strong opposition, and for some years political questions were contested on both sides of the house with a great display of talent. He took an active part against Warren Hastings, supported the efforts of Wilberforce against the slave trade, and moved the

Charles James Fox.

repeal of the Test and Corporation Acts. He welcomed the breaking out of the French revolution, and his views on this subject led to a memorable break between him and his old friend Burke. Fox firmly opposed the principle on which the war against France was begun, and strenuously argued for peace on every occasion; but eventually, on becoming secretary for foreign affairs in 1806, acquiesced in the propriety of the war. His health, which had been impaired by his loose manner of living, now began rapidly to decline, and he died the same year a few months after the death of Pitt, his great rival. As a powerful and purely argumentative orator he was of the very first class; although as to eloquence and brilliancy he perhaps yielded to Pitt, Burke, and Sheridan; nor were his voice and manner prepossessing, al-

though highly forcible. He was of an amiable nature, and a sincere friend to all broad and liberal principles of government. His *History of the Early Part of the Reign of James II* was published posthumously.

Fox, GEORGE, the founder of the Society of Friends, or Quakers, was born at Drayton, in Leicestershire, in 1624, his father being a weaver. He was educated religiously, and at the age of nineteen persuaded himself that he had received a divine command to forsake everything else and devote himself wholly to religion. He accordingly forsook his relations, equipped himself in a leathern doublet, and wandered from place to place, supporting himself as he could. During this itinerant life he fasted much, sometimes sitting the whole day in a retired spot reading the Bible. In 1648 he commenced to preach publicly at Manchester, about which time he also adopted the peculiar language and manners of Quakerism. At Derby his followers were first denominated *Quakers*, in consequence of their trembling mode of delivery and calls on the magistracy to tremble before the Lord. In 1655 he was sent a prisoner to Cromwell, who, having ascertained the pacific tendency of his doctrines, had him set at liberty. He was, however, treated with great severity by the country magistracy and the sterner Puritans, who disliked the mysticism and want of firm doctrines in his preaching. In 1666 he set about forming the people who had followed his doctrines into a formal and united society. In 1669 he married the widow of Judge Fell, and soon after went to America, where he remained two years, which he employed in making proselytes. On his return he was thrown into Worcester jail, but was quickly released, and went to Holland. He soon after returned, and was cast in a suit for tithes, which he deemed it unlawful to pay. In 1684 he again visited Europe. He died in 1691, the Society of Friends having by that time acquired considerable importance. The writings of Fox have been collected into three volumes.

Fox, MARGARET, spiritualist, was born at Bath, Canada, in 1836; died in 1893. The cult of spiritualism began with her and her sisters, Leah and Catharine. While living in their father's house, at Hydeville, New York, in 1847-48, a series of mysterious rappings took place which were claimed to be the work of spirits of the dead. From this modern spiritualism, which has now grown so prominent, arose. The sisters gave séances for many years, and Margaret is said to have been privately married to Dr. Kane, the Arctic explorer, in 1856.

Fox-bats, or FLYING FOXES, a name given to the fruit-eating bats of the family Pteropidæ, including some of the largest of the bat tribe, one species, the *Pteropus edŭlis* or kalong, attaining a length of from 4 to 5 feet from the tip of one wing to the tip of the other. They inhabit Australia, Java, Sumatra, Borneo, etc., as well as the continents of Asia and Africa.

Foxe, JOHN, an English church historian, born in 1517. He studied at Oxford, and was elected a fellow of Magdalen in 1543, from which he was expelled two years later on a charge of heresy. In the reign of Edward VI he was restored to his fellowship, but during Mary's reign again went abroad, to Basel. On the accession of Elizabeth he returned to his native country, and was received in the most friendly manner by his former pupil, the Duke of Norfolk, who settled a pension on him. Secretary Cecil also obtained for him a prebend in the church of Salisbury; and he might have received much higher preferment if he would have subscribed to the articles enforced by the ecclesiastical commissioners. He died in 1587. His principal work is the *History of the Acts and Monuments of the Church*, commonly called *Foxe's Book of Martyrs*, first printed in 1563, in one vol. folio.

Fox'glove, a genus of plants, *Digitālis purpurĕa*, natural order Scrophulariaceæ. It grows on banks, pastures, etc., in hilly and rocky countries in Europe, Asia, and the Canary Islands. Its flowers are campanulate, and somewhat resembling the finger of a glove. It is one of the most stately and beautiful of the herbaceous plants, and one that has great reputation as a medicinal plant, being employed as a sedative, narcotic, and diuretic in diseases of the heart and in dropsy. Its medicinal properties are due to the glucoside known as digitalin. A decoction or infusion of the leaves is what is generally used. The flowers are usually purple, but sometimes white. Several species are grown in gardens, such as *D. grandiflŏra* and *D. lutĕa*, with yellow flowers, and *D. ferruginĕa* with brown.

Foxhound, a hound for chasing foxes, a variety of hound in which are combined, in the highest degree of excellence, fleetness, strength, spirit, fine scent, perseverance, and subordination. The foxhound is smaller than the staghound, its average height being from 20 to 22 inches. It is supposed to be a mixed breed between the

staghound or the bloodhound and the greyhound. It is commonly of a white color with patches of black and tan.

Fox Hunting, a favorite English sport much practised during the autumnal and winter months. A *pack* of foxhounds consists of from 20 to 60 couples of hounds according to the frequency of the hunting days. These dogs are carefully bred and trained (see *Foxhound*), and are under the superintendence of one experienced gentleman called the *master*, who has the general control of the whole 'field.' Under him is the *huntsman*, whose duty it is to look after the hounds in their kennels and direct them in the field. He is directly responsible for their condition and training. Next him are the *whippers-in*, whose main duty is that of assisting generally the huntsman both in the kennels and in the field. A less important function of the whipper-in is that of urging on lagging hounds. The night before the hunt, the gamekeeper, calculating on the habits of the fox to leave his burrow or 'earth' in search of food at night, stops all the 'earths' after the foxes have left them. The animals are thus forced to seek refuge in neighboring thickets or other cover, generally near their 'earth,' and this fact determines the arrangements of the day's hunting. The huntsmen assemble in the neighborhood of the stopped 'earth' and draw the neighboring coverts by *throwing off* the dogs to search for the fox. The presence of the fox is generally indicated by the whine of some old and experienced hound who has first scented him; but he may *hang* or keep within the covert for a long time. The person who first sees the fox leave the covert, *break cover* as it is called, gives the *view-halloo* after it has got some little distance, upon which the huntsman collects his hounds and sets off in chase followed by the entire field. The foxhounds follow almost entirely by scent, the fox being itself perhaps far ahead and out of sight. Wherever, therefore, the scent fails the hounds are *at fault*, and there is a *check* till the scent is recovered. When the scent is good most of the hounds *own* it by giving tongue, and they are then said to be in *full cry*. The rider who is first in at *the death* lashes the hounds off and secures the head, feet or *pads*, and tail or *brush* of the fox. The midland counties of England, Leicester, Warwick, Yorkshire, etc., are the most celebrated for fox hunting. Although introduced into the United States, it has never been so ardently pursued here as it has been in England.

Fox Indians, a tribe of N. American Indians belonging to the Algonkian family, now few in numbers and scattered over Oklahoma, Iowa and Kansas.

Fox River, a river of Wisconsin, which enters Green Bay, after passing through Lake Winnebago. It is connected by canal with the Mississippi.

Fox-shark. See *Thresher-shark.*

Foxtail-grass, the common name given to the grasses of the genus *Alopecūrus*, because of the close cylindrical panicle in which the spikelets of flowers are arranged, having somewhat the shape of a fox's tail.

Fox Terrier (ter'i-er), the typical dog of the terrier class. While the origin of the fox terrier is of considerable antiquity, and though he has emerged from heterogeneous sources, it is generally conceded that he is the result of a judicious cross between the bull terrier and the black and tan, or between the bull terrier and the beagle. The starting-point of the modern fox terrier dates from about 1860. There are two varieties of this breed: the smooth-haired and the wire-haired. As the latter differs from the former only in the matter of coat, a brief summary of the points of the smooth-coated dog will suffice for both. The head is flat and moderately narrow, decreasing in width to the eyes. The ears are V-shaped and small, dropping forward close to the head, not hanging like a fox hound's. The jaws, upper and under, are strong and muscular, adapted for punishing. The eyes are dark, small, full of life, fire and intelligence. Nose, black. The chest, deep, but not broad. Tail, usually docked, is set rather high and carried gaily. Legs are straight throughout, having no appearance of ankle in front. Coat is straight, flat, smooth, hard, dense and abundant. Color should be white with markings of black or light tan, especially about the head. In character, the fox terrier is gay, lively, alert, intelligent and loyal, and of unfailing pluck. In weight he should not scale over 20 pounds.

Foy (fwȧ), MAXIMILIAN SEBASTIAN, a French general, born in 1775. He served with distinction under Dumouriez, Moreau, and Masséna. In 1815 he commanded a division at Waterloo, where he was wounded for the fifteenth time. He died at Paris in 1825.

Foyle (foil), river of Ireland, flowing N. E. through Tyrone, Donegal, and Londonderry and falling into Lough Foyle near Londonderry. It is navigable

up to Londonderry for vessels of 800 tons.

Foyle, Lough, the estuary of the river Foyle, on the north coast of Ireland, between the counties of Derry and Donegal. It is 16 miles long from northeast to southwest, 1 mile wide at its entrance, and 9 miles broad in the interior. A great part of the bed is exposed at low water.

Fra (frä), an Italian prefix, derived from the word *frate*, brother, and used before the names of monks; for instance, *Fra Giovanni*, Brother John.

Fra Bartolomeo. See *Baccio della Porta.*

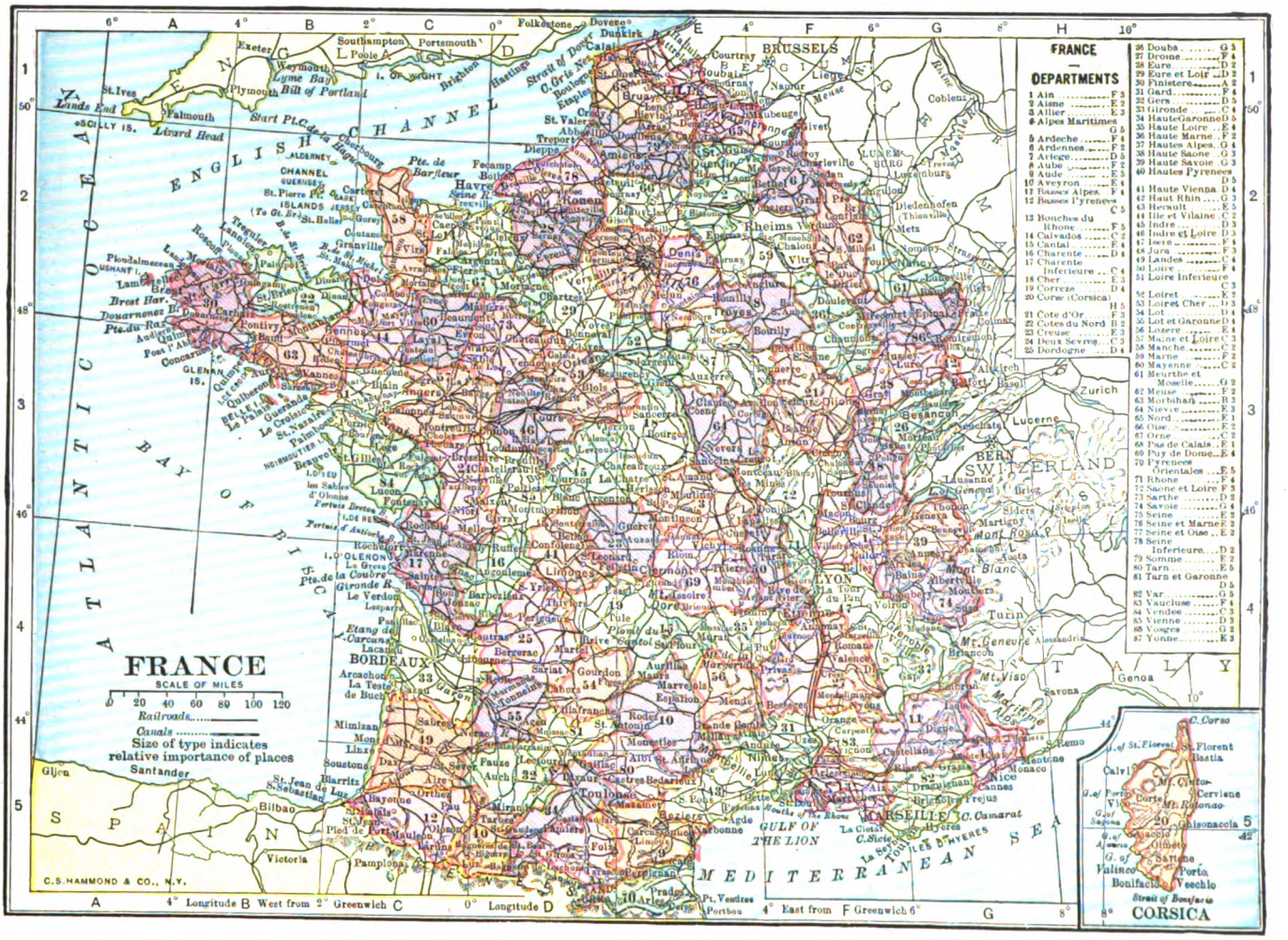
Fraction (frak'shun), in arithmetic and algebra, a combination of numbers representing one or more parts of a unit or integer: thus, four-fifths (⅘) is a fraction formed by dividing a unit into five equal parts, and taking one part four times. Fractions are divided into *vulgar* and *decimal.* Vulgar fractions are expressed by two numbers, one above another, with a line between them. The lower, the *denominator*, indicates into how many equal parts the unit is divided; and the number above the line, called the *numerator*, indicates how many of such parts are taken. A *proper fraction* is one whose numerator is less than its denominator. An *improper fraction* is one whose numerator is not less than its denominator. as ⅞, ⅞. A *simple fraction* expresses one or more of the equal parts into which the unit is divided, without reference to any other fraction. A *compound fraction* expresses one or more of the equal parts into which another fraction or a mixed number is divided. Compound fractions have the word *of* interposed between the simple fractions of which they are composed: thus, ½ *of* ⅔ of 1½ is a compound fraction. A *complex fraction* is that which has a fraction either in its numerator or denominator, or in each of them: thus,

$\frac{5\frac{1}{2}}{9}$, $\frac{8}{9\frac{1}{2}}$ and $\frac{5\frac{1}{2}}{6\frac{1}{2}}$ are complex fractions. In *decimal fractions* the denominator is 10, or some number produced by the continued multiplication of 10 as a factor, such as 100, 1000, etc.; hence, there is no necessity for writing the denominator, and the fraction is usually expressed by putting a point (.) before the numerator, as $.5=\frac{5}{10}$; $.25=\frac{25}{100}$; $.05=\frac{5}{100}$. The expression 542.461 would thus be equivalent to $542\frac{461}{1000}$. All calculations are much simplified in decimal fractions; yet, simple as the system is, it was discovered first in the fifteenth century by the German mathematician Regiomontanus.

Fracture (frak'tūr), in mineralogy, is the manner in which a mineral breaks, and by which its texture is displayed; thus, a fracture is *even* when it shows a level face or plane of some extent; *uneven*, when the surface is rough and broken; *conchoidal*, when one side is convex and the other concave, as in a molluscous shell; *fibrous*, when the separated edges have the appearance of torn filaments; *hackly*, when there are many fine sharp points or inequalities.

Fracture, in surgery, is the breaking of a bone. It is simple when the bone only is divided; compound when there is also a wound of the soft parts leading down to the fracture. A fracture is termed *transverse, longitudinal*, or *oblique* according to its direction in regard to the axis of the bone. It is called *complicated* if accompanied with dislocation, severe contusions, wounded blood-vessels, or any disease which prevents the union of the bones and causes them to be very easily broken. A *comminuted* fracture is one in which the bone is broken into several small pieces at the point of rupture. An *incomplete* fracture is one in which only a portion of the fibers is broken. A *stellate* fracture is a series of fractures radiating from a center. When a fracture takes place there is a pouring out of fluid—lymph—and cells from the blood contained in the vessels of the lining membrane of the bone as well as from the vessels of the soft parts which have also suffered injury. This material surrounds the broken ends of the bone, becomes firm and consolidated, and in about three weeks is hard enough to keep the broken ends in position. A formation of bone then takes place round the seat of fracture. This is called 'provisional callus,' because, when the process of repair is completed and true bone has formed to unite the break, it is reabsorbed and gradually disappears. Meanwhile a process of repair goes on between the broken ends, uniting them by the formation of true bone or 'definitive callus.' The more quickly and accurately after the break the broken ends are brought together, the more rapid will be the reunion. The treatment of a simple fractured bone is to bring the portions into their natural position and to keep them permanently thus, by splints of some kind, pasteboard splints, for instance, dipped in warm water, with wooden ones exterior to them; or a mass of plaster of Paris may be used for the same purpose.

Fra Diavolo (frä de-ä'vo-lo), a celebrated Neapolitan brigand, whose real name was Michele


FRANCE
SCALE OF MILES
0 20 40 60 80 100 120
Railroads
Canals
Size of type indicates relative importance of places
FRANCE
DEPARTMENTS
1 Ain F 3
2 Aisne E 3
3 Allier E 3
4 Alpes Maritimes G 5
5 Ardeche F 4
6 Ardennes F 2
7 Ariege F 5
8 Aube E 3
9 Aude E 5
10 Aveyron E 4
11 Basses Alpes F 4
12 Basses Pyrenees C 5
13 Bouches du Rhone F 5
14 Calvados C 2
15 Cantal E 4
16 Charente D 4
17 Charente Inferieure C 4
18 Cher E 3
19 Corrèze D 4
20 Corse (Corsica) H 5
21 Cote d'Or F 3
22 Cotes du Nord B 2
23 Creuse E 3
24 Deux Sevres C 3
25 Dordogne D 4
26 Doubs G 3
27 Drome F 4
28 Eure D 2
29 Eure et Loir D 2
30 Finistere A 2
31 Gard F 4
32 Gers D 5
33 Gironde C 4
34 Haute Garonne D 5
35 Haute Loire E 4
36 Haute Marne F 2
37 Hautes Alpes G 4
38 Haute Saone G 3
39 Haute Savoie G 3
40 Hautes Pyrenees C 5
41 Haute Vienna D 4
42 Haut Rhin G 3
43 Herault E 5
44 Ille et Vilaine C 2
45 Indre D 3
46 Indre et Loire D 3
47 Isere F 4
48 Jura F 3
49 Landes C 4
50 Loire F 4
51 Loire Inferieure
52 Loiret E 3
53 Loiret Cher D 3
54 Lot E 4
55 Lot et Garonne D 4
56 Lozere E 4
57 Maine et Loire C 3
58 Manche C 2
59 Marne F 2
60 Mayenne C 2
61 Meurthe et Moselle G 2
62 Meuse F 2
63 Morbihan B 3
64 Nievre E 3
65 Nord F 1
66 Oise E 2
67 Orne C 2
68 Pas de Calais F 1
69 Puy de Dome E 4
70 Pyrenees Orientales E 5
71 Rhone F 4
72 Saone et Loire F 3
73 Sarthe D 3
74 Savoie G 4
75 Seine E 2
76 Seine et Marne E 2
77 Seine et Oise E 2
78 Seine Inferieure D 2
79 Somme E 2
80 Tarn E 5
81 Tarn et Garonne D 5
82 Var G 5
83 Vaucluse F 4
84 Vendee C 3
85 Vienne D 3
86 Vosges G 3
87 Yonne E 3
ENGLISH CHANNEL
ATLANTIC OCEAN
BAY OF BISCAY
MEDITERRANEAN SEA
BRUSSELS
BELGIUM
GERMANY
SWITZERLAND
BERN
ITALY
SPAIN
BORDEAUX
MARSEILLE
LYON
PARIS
GULF OF THE LION
CORSICA
C.S. HAMMOND & CO., N.Y.
A 4° Longitude B West from 2° Greenwich C 0° Longitude D 4° East from F Greenwich 6° G 8°

Pezza. He was born in Calabria in 1760. He quitted the trade of stocking weaving for the army, and served for a time in the Papal Legion. He afterwards became a monk, but was expelled on account of misconduct. He then joined a troop of brigands, of which he became in a short time the leader. The government set a price upon his head; but later, having need of Fra Diavolo's services against the French, they pardoned him and gave him a colonel's commission. At the head of his band he harassed the French, took refuge in Calabria after the conquest of Naples by Bonaparte, and incited the people against the French. He fell at last into their hands in 1806, and was executed as a robber and incendiary. The *Fra Diavolo* of Auber's opera has little or nothing in common with the real Fra Diavolo.

Fraise (frāz), in fortification, a defense consisting of pointed stakes driven into the ramparts in a horizontal or inclined position.

Framingham (frā'm'ing-ham), a town of Middlesex County, Massachusetts, 23 miles W. of Boston. Manufactures straw goods, shoes, woolens, paper and rubber goods, steam boilers, machinery, etc. A State normal school is located here. Pop. 12,948.

Franc (frangk), a modern French silver coin, but the same name was given to two ancient coins in France, one of gold and the other of silver. The value of the gold franc was about $2.50. The silver franc was in value a third of the gold one. The name was given from the device *Francorum Rex*, 'King of the French,' on the coin when first struck by King John in 1360. The modern French franc is a silver coin and money of account which since 1795 has formed the unit of the French monetary system, and has also been adopted as the unit of currency by Switzerland and Belgium. It is of the value of a little over 19 cents, and is divided into 100 centimes. Coins of the same value, though under different names, have been adopted in several other countries of Europe, as the basis of their system of currency.

Francavilla (frän-kä-vil'lä), several places in Southern Italy. The most important is in the province of Lecce, 14 miles W. S. W. of Brindisi. Pop. (1906) 17,759.

France (frans; anciently *Gallia*), a maritime country in the west of Europe, forming one of its most extensive, most populous, and most influential states. It is situated between lat. 42° 20′ and 51° 5′ N.; and lon. 4° 50′ W. and 7° 40′ E., and is bounded N. by the Strait of Dover and the English Channel; W. by the Atlantic (Bay of Biscay); S. by Spain and the Mediterranean Sea; E. and N. E. by Italy, Switzerland, Germany, and Belgium. Its greatest length from north to south is 600 miles, and its greatest breadth 547 miles. The coast-line on the whole is considerably diversified by bays, estuaries, and indentations of various kinds, and presents numerous good harbors and roadsteads. It is studded by a number of islands, especially in the northwest and west, the largest being Oléron, Ré, and Belle Isle. The total area (including Corsica) is 204,092 sq. miles. The capital is Paris; the other large towns in order of population are Marseilles, Lyons, Bordeaux, Lille, Toulouse, St. Etienne, Roubaix, Nantes, and Havre.

Mountains.—The interior is traversed from southwest to northeast by successive chains of mountains, commencing with the Pyrenees and including the Cevennes, the Côte d'Or, the Vosges, and others, forming the watershed, on one side of which the rivers flow west and north into the Atlantic and the English Channel, on the other side east and south into the Mediterranean. At its northeastern extremity this system is met by the Alps and the Jura. A considerable portion of the Western Alps belongs to Southeastern France. Mont Blanc itself (15,781 feet) is mostly within the French boundary-line. Some lofty Pyrenean peaks are also within French territory, the highest being Vignemale (10,792 feet). Near the center of France, and separate from the great watershed of the country, are several groups of volcanic mountains known by the general name of the mountains of Auvergne, the chief peaks of which are the Plomb du Cantal (5983 feet), the Puy de Sancy (6100 feet), and the Puy de Dôme.

Rivers.—The spurs thrown off by the great watershed divide France into seven principal river basins, six of which are on the northwestern slope and one on the southeastern. These are:—1. The basin of the Garonne and its affluents (the Ariège, Tarn, Lot, and Dordogne on the right, and the Gers on the left); with the two secondary basins of the Charente on the north, and the Adour on the south. 2. The basin of the Loire and its tributaries (Nièvre and Maine on the right, the Allier, Loiret, Cher, Indre, Vienne, and Sèvre Nantaise on the left). 3. The basin of the Seine and its tributaries (the Aude, Marne, and Oise on the right, the Yonne and Eure on the left. To the north is the secondary basin of the

Somme. 4. The basin of the Meuse with its affluent, the Sambre. 5. The basin of the Escaut or Scheldt with its affluent the Scarpe. Only the southern portion of these two basins is included within the political boundaries of France. 6. The basin which pours a number of tributaries, the principal of which is the Moselle, into the Rhine. Only a comparatively small portion of this basin also is included within the political boundaries of France. 7. The basin of the Rhône, occupying the whole of the territory which lies to the southeast of the great watershed, the tributaries being the Ain, the Saône, Ardèche, and Gard on the right, and the Isère, Drôme, and Durance on the left. The secondary basins are those of the Var and the Aude. The four great rivers of France are the Loire, Seine, Rhône, and Garonne. France has in all more than 200 navigable streams, with a total navigation of about 5500 miles. Lakes are few, and individually very limited in extent.

Geology.—Among geological formations granite holds a chief place as forming the nucleus of the mountains generally, and being the prevailing rock in the Alps, the Pyrenees, the Cevennes, and in the northwest peninsular portion of the country (Brittany). The other crystalline rocks, consisting chiefly of trachytes and basalts, have received a magnificent development in Auvergne, where whole mountains are composed of them, and where the effects of remote volcanic agency are still visible in extinct craters and lava streams. In the Jura limestone occurs in such enormous masses as to have given its name to a peculiar formation (the Jurassic). The granite is overlaid by gneiss, micaceous and argillaceous slates, succeeded, particularly in the Pyrenees, by mountain limestone. The secondary formation, commencing with this limestone, is largely developed in many parts, and furnishes a considerable number of coal and mineral fields. The tertiary formation covers a vast extent of surface, particularly in the southwest and around Paris.

Climate.—Lying almost wholly within the more moderate portion of the temperate zone, between the isothermal lines of 50° and 60°, France has a climate not inferior to that of any country in Europe. In the south, and particularly the southeast, which is the warmest, the olive is successfully cultivated. Further north to a limit determined by a line drawn diagonally in a E. N. E. direction from the department of Gironde to that of the Vosges, the cultivation of maize or Indian corn extends. More northward still, a line drawn from the mouth of the Loire to Mezières in the Ardennes department marks the extreme limit of the profitable culture of the vine. Beyond this line is the fourth and coldest region. All these regions, notwithstanding their diversities of temperature, are generally healthy, and have an atmosphere remarkable for salubrity, serenity, and brightness.

Agriculture, Etc.—About nine-tenths of the soil of France is productive, and about one-half of the whole is under the plow. The cereals forming the great bulk of the cultivated crops are wheat, oats, rye, and barley. The crops next in importance to these are meslin or mixed corn, potatoes, hemp, rape, maize, buckwheat, flax, and beet. Beet is cultivated extensively in some departments, especially in that of Nord, for the manufacture of sugar. The cultivation of tobacco is monopolized by the government, and is confined to certain departments. In France the grass is on a much more limited scale than the arable husbandry, and the breeding of cattle is indifferently practised. The rearing of sheep is more successful, much of the wool being scarcely inferior to merino wool. Excellent horses are bred in the north, and as there is an extensive demand for horses for the army, considerable pains are taken in the government studs to improve the breeds. Asses and mules, generally of a superior description, are much employed. The cultivation of the vine is one of the most important branches of French agriculture, the total quantity of land in vineyards being nearly a twenty-fifth of the whole surface. In everything relating to this branch of culture the French are unsurpassed, the various first-class wines which they produce under the names of Champagne, Burgundy, Bordeaux, etc., being universally known. It is estimated that in good years France produces about one-half of the whole wine production of the world. Since about 1870 the vineyards have suffered greatly from the devastations of the *Phylloxera*, an insect introduced from America. Among the most important fruit-trees cultivated in France are the apple, from the fruit of which much cider is made, especially in Normandy; the chestnut, which in some of the central districts of France is a staple of food among the poorer classes; the mulberry tree, cultivated in the southeast both for its fruit and its leaves, the latter furnishing the food of the silkworms so largely reared here; the olive also in the southeast; the pear, plum, peach, orange,

citron, fig, etc. The forests occupy about one-seventh of the whole territory.

Minerals.—Coalfields are numerous, but only two are really of importance—that of Valenciennes in the northeast, forming the western extremity of the great Belgian coalfield, and that of St. Etienne in the southeast, to which the manufactures of that town, Lyons, and the surrounding districts are indebted for much of their prosperity. The annual output falls so far short of the annual consumption that a large import takes place from England and Belgium, particularly the latter, and wood continues to be the common fuel throughout France, at least for domestic purposes. The coalfields contain seams of iron, which are extensively worked, and furnish ore to a great number of blast-furnaces; but of the total amount of ore smelted in the country a considerable proportion is imported. Other metals, such as lead, zinc, manganese, copper, etc., are obtained to some extent. Common salt is obtained from mines of rock-salt, from salt-springs, and in still greater quantity from lagoons and salt-marshes on the coast.

Manufactures.—The most important of the textile manufactures is that of silk goods, having its chief seat at Lyons and the surrounding districts. It employs about two millions of persons, and furnishes about 27 per cent. in value of the whole of the manufactured products of France. After silk goods, though at a considerable distance, follow cotton stuffs and woolens, made largely at Rheims, Amiens, and Beauvais; carpets at Abbeville; tapestry at Paris and Beauvais; linens, including fine muslin, gauze, and lace at St. Quentin, etc.; cutlery, porcelain, stoneware, and common pottery, beet-root sugar, leather, paper, hats, hosiery, steel, iron, brass, and zinc ware, plate and flint glass, etc., besides many ornamental and artistic articles; jewelry, clocks, surgical instruments, types, engravings, etc., which have their common seat in the capital.

Fisheries.—The fisheries of France are important. Amongst the principal is that of sardines on the coast of the Bay of Biscay; that of herring, mackerel, turbot, salmon, etc., in the English Channel and the North Sea; that of tunnies and anchovies on the coasts of the Mediterranean. Oyster-breeding is largely engaged in, the most extensive oyster-beds being those of the basin of Arcachon in the department of the Gironde. Cod-fishing is carried on actively near the Newfoundland banks by French fishermen, and also near Iceland.

Commerce.—The principal towns from which the internal commerce emanates are Paris, Lyons, Rouen, Lille, St. Etienne, Toulouse, Nîmes, Nancy, Perpignan, etc. The foreign commerce is chiefly with Great Britain, Belgium, Germany, and Italy. Britain is far ahead of the others, its imports being chiefly silks, woolens, butter, eggs, wine and brandy, and sugar; its exports chiefly wool and woolens, cottons and cotton yarn, coal, machinery, and metals. The shipping of France is much below what might be expected from the development of its foreign commerce, considerably more than one-half of which is carried by foreign vessels. The chief seaports are Marseilles, Havre, Bordeaux, Rouen, Nantes (including St. Nazaire), Dunkirk, Calais, Boulogne, Dieppe.

Canals, Railways, Etc.—The canals are numerous. The Canal du Midi, or, as it is sometimes called, the Canal of Languedoc, starting from a point in the Garonne a little below Toulouse, is continued in an E. S. E. direction into the lagoon of Thau, and thereby gives a continuous navigable communication between the Atlantic and the Mediterranean, in the line of the important towns of Bordeaux, Agen, Toulouse, Carcassonne, and Narbonne. In like manner three separate canals cut across the basin of the Rhône; the Canal du Centre, or of Charollais, connecting the Saône and the Loire; the Rhône and Rhine Canal, so called from uniting these two rivers, partly by the intervention of the Doubs; and the Canal of Bourgogne, connecting the Saône, Yonne, and Seine. In all, France possesses about 3000 miles of canals in addition to about 5500 miles of navigable rivers, giving a total equal to about 1 mile of internal navigation for every 25 square miles of surface. The railways in France, about 30,000 miles long, partly belong to the state, and partly have been granted to private companies for a limited period, at the end of which they will become state property.

Administration of Justice.—In accordance with the general arrangement which divides the whole country into departments, each department into arrondissements, each arrondissement into cantons, and each canton into communes, there is a series of courts, commencing with the justice of peace (*juge de paix*) of each commune, who judges in petty causes, but whose more appropriate function is understood to be to act as a kind of umpire between parties at variance, and induce them to settle their differences without proceeding to formal litigation. Failing such arrangement, the complainant brings

his action before the court of first resort (*tribunal de première instance*), there being one such in every arrondissement, besides a *tribunal de commerce* to which mercantile and commercial causes are appropriated. From these courts an appeal lies to the courts of appeal (*cours d'appel*), of which there are twenty-seven, each having jurisdiction over several departments. The most important commercial and manufacturing towns have also commercial courts (*tribunaux de commerce*), the members of which are elected by the chief business men of the respective places. Above all these courts, and properly the only supreme court of the state, is the *cour de cassation*, which has the power of reviewing and annulling the decrees of inferior courts. It sits in the capital.

Education and Religion.—In France the superintendence of education in all its branches is expressly committed to a high functionary, who takes the name of minister of public instruction and fine arts and is assisted by an educational council. The highest educational institutions are either special institutions, such as the Museum of Natural History, the Collège de France, the Polytechnic school; or are a sort of university colleges known as 'faculties' (*Facultés de l'État*), each of which is specially devoted to literature, law, medicine, theology, etc. Several of these are usually grouped together to form one *académie*, there being fifteen academies in all. At these establishments the education given is of the highest description, and need not be particularized. Secondary instruction, either classical or commercial and industrial, is given by the state in the lyceums, by the communes in the communal colleges, or in certain other seminaries. There are about 90 lyceums, generally situated in the capitals of the departments, and over 250 colleges. Primary instruction is given in the communal schools, being compulsory and free. Religion was also, until the year 1906, under the cognizance of the state, and fell within the province of the minister of justice and religion. The state declared that the Roman Catholic was the religion of the majority, but did not establish it; on the contrary, it placed all forms of religion which had more than 100,000 adherents, and were not obviously subversive of social order, on an equal footing, and professed to deal impartially with all by paying salaries to their ministers. But by a law enacted in Dec., 1905, all religions have been disestablished, and church and state separated, while education has been made secular. (See also *Gallican Church.*) Protestants are less than 2 per cent. of the population.

Army and Navy.—By law military service is declared to be obligatory upon every Frenchman who is not pronounced unfit for military service. They have to serve first in the regular army (*armée active*) for three years, then in the reserve of the regular army for six years, next in the territorial army for six years, and finally in the reserve of the territorial army for ten years. This gives France on a peace footing an army of more than half a million, which on a war footing may be brought up to two millions. The French navy is manned partly by conscription and partly by voluntary enrollment. In 1910 the French navy consisted of 25 battleships, 53 cruisers, 14 gunboats, 68 destroyers, 380 torpedo boats, and 56 submarines.

Finance.—France has now one of the largest rates of revenue and expenditure of the nations and a public debt exceeding that of any other country, the total debt amounting to over $5,800,000,000. The chief items of revenue are excise and customs, registration, stamps, posts and telegraphs, and other state monopolies, land tax, licenses, etc.

Constitution.—France has been a republic since the overthrow of the second empire by a Paris mob on the 4th of September, 1870. The details of the constitution were fixed by a law passed by a national assembly which met in 1871 (some revision having been made since). This law places the legislative authority in the hands of an assembly composed of two chambers, the chamber of deputies and the senate. The chamber of deputies is elected by universal suffrage, each department forming one electoral district and a member being elected for every 70,000 inhabitants. The deputies are elected for four years. The senate consists of 300 members, of whom 75 were originally elected for life; but in 1884 it was enacted that vacancies among the life senatorships should be filled up as they arose by the election of ordinary nine-year senators. Both senators and deputies are paid. The head of the government is a president, elected for seven years by a majority of votes of the members of the two chambers sitting as one. The president is assisted by a body of ministers appointed by him. He has the appointment to all civil and military posts.

Weights, Measures, and Money.—The unit of the French monetary system is the franc (of the value of a little over 19 cents), which is divided decimally. (See

Decimal System.) The system of weights and measures is also decimal, the units with their English equivalents being as follows:—the mètre=39.37 inches or 3.28 feet; the kilomètre, or 1000 mètres = 1093.6 yards or .621 of a mile; the are, the square of 10 mètres=1076.441 square feet; the hectare, or 100 ares= 2.47 acres; the square kilomètre=.386 of a square mile; the stère or cubic mètre= 35.317 cubic feet; the litre=1.76 pints; the hectolitre or hundred litres=22.0097 gallons; the gramme=15.4323 grains; the kilogramme or 1000 grammes=2.205 lbs.

Political Divisions and Extent of Empire.—Before the revolution of 1789 France was divided into general governments or provinces, the number of which varied at different epochs. Under Francis I, by whom they were instituted, there were nine, namely, Normandie, Guyenne, Languedoc, Provence, Dauphiné, Bourgogne, Champagne-et-Brie, Picardie, Ile de France. Under Henry III there were twelve, formed by the addition of Bretagne, Orléanais, and Lyonnais. Under Louis XIV the number was fixed at thirty-two, to which a thirty-third was added by the acquisition of Corsica under Louis XV. At the revolution the whole of France, including Corsica, was parcelled out into departments, and each department subdivided successively into arrondissements, cantons, and communes. This division, carried out in 1790, has since maintained its ground. The number of departments was originally eighty-three, but it has been at different times increased and decreased. There are now eighty-seven departments, the last formed being Haut-Rhin (Belfort). The average area of each is about 2300 sq. miles (more than one-third that of Wales). The most recently acquired territories were Nice and Savoie. By the Franco-German war of 1870-71 nearly all Alsace and part of Lorraine was lost. In addition to the territory it occupies in Europe, France possesses (either absolutely or as protected territories) Algeria, Tunis, Senegambia, and other territories in West Africa, a large area in western Sahara and another large area of the Congo region, each of considerably more than 1,000,000 square miles; Reunion, Madagascar and other East African islands; Cochin-China, Tonquin, Anam, and smaller possessions in Asia; French Guiana in S. America, with the islands of Guadeloupe, Martinique, etc.; New Caledonia, Tahiti, etc., in the Pacific. The total French dominions are thus as follows:—

	Area in Sq. Miles.	Population.
France	204,092	38,961,945
Asiatic possessions.	256,000	17,107,000
African do. .	3,520,000	12,948,300
American do. .	41,600	425,270
Oceanic do. .	9,112	85,668
	4,030,814	69,528,183

History.—France or Gaul, at the earliest period of which anything is known with regard to it, was inhabited by a number of independent tribes, who appear to have been mainly Celtic in race. In the latter half of the second century B. C. the Romans conquered a portion of the southeast, and under Julius Cæsar the conquest of all Gaul was completed between 58 and 51 B.C. (See *Gaul.*) Subsequently the country became completely Romanized in language, civilization, and religion, and many flourishing towns sprang up. In the decline of the Roman empire German tribes began to make settlements in Gaul, and it was from a body of these known as *Franks* that the name France arose. Towards the end of the fifth century Clovis, chief of the Salian Franks, made himself master not only of almost all France (or Gaul), but also of a considerable territory east of the Rhine. The dynasty which he founded was called the Merovingian, from his grandfather, Merovæus. Clovis died in 511, leaving his kingdom to be divided amongst his four sons, a plan often followed by subsequent rulers. The Frankish dominions were thus differently divided at different times; but two divisions, a western and an eastern, or Neustria and Austrasia, became the most important. A large part of the history of the Franks under the Merovingian kings is the history of the contests between these two states. Latterly Pippin or Pépin d'Héristal, mayor of the palace of the Austrasian king, conquered Neustria and made his sway supreme throughout the kingdom of the Franks. This date may be regarded as that of the real termination of the Merovingian line, for although kings belonging to this family continued to be crowned till 752, they were mere puppets, 'rois fainéants' as they are generally called; the real power was in the hands of the mayors of the palace. Pépin died in 714. He was succeeded, after a brief period of anarchy, by his son Charles Martel, or Charles the Hammer—a title he earned by the courage and strength he displayed in battle. During his tenure of power all Europe was threatened by the Saracens, who, after occupying Spain, had penetrated into France, and were met by Charles Martel on a plain between Tours and Poitiers, and totally defeated (732),

Charles Martel died in 741, leaving Austrasia and the countries beyond the Rhine to his son Carloman, and Neustria and Burgundy to his son Pépin the Short. On his brother's death Pépin seized his heritage, and in 752, thinking it time to have done with the system of *rois fainéants*, had himself crowned King of the Franks. In 768 he died, and was succeeded by his sons Charles, afterwards known as Charlemagne (Charles the Great), and Carloman. The latter dying in 771, Charlemagne became sole ruler, and conquered and organized an empire which extended from the Atlantic on the west to the Elbe, the Saale, and the Bohemian mountains on the east, and embraced also three-fourths of Italy, and Spain as far as the Ebro. By Pope Leo III on Christmas Day in the year 800 he was crowned in the name of the Roman people as Emperor of the West. There was as yet, strictly speaking, no kingdom of France, Charlemagne being a German and his empire a German one.

To Charlemagne succeeded in 814 his youngest son Louis *the Pious*. At the death of the latter the empire, after many disputes, was eventually divided by the Treaty of Verdun in 843 amongst his sons, the portion nearly corresponding to modern France falling to Charles the Bald. From this time the separate history of France properly begins, the history of the French language being also traced to the same period, while the eastern portion of the old Frankish territory remained German. After Charles the Bald, the first of the Carlovingian kings, had been succeeded in 877 by Louis II, and Louis II by Louis III (879-882) and Carloman (879-884), Charles the Fat, king of the eastern Frankish territory, became ruler of the western also till 887, when he was deposed. After a brief usurpation by Eudes, Count of Paris, Charles III, the brother of Louis III, was recognized as king. But his kingship was little more than nominal, France being divided into a number of great fiefs, the possessors of which, though acknowledging the feudal supremacy of Charles, were practically independent. In these circumstances Charles, unable to offer any adequate resistance to the Norman pirates who were devastating the coast and making incursions into French territory, surrendered to them, in 912, the province which took from them the name of Normandy. Towards the end of his reign Hugh of Paris, as he is generally called, Duke of France, was really the most powerful person in the kingdom, and throughout the reigns of Louis IV, Lothaire and Louis V, he and his son Hugh Capet held the real power. On the death of Louis V without children in 987 Hugh Capet was chosen as king, and thus became the founder of the Capetian dynasty. The great fiefs of Paris and Orleans, which he controlled, were thus added to the crown, and Paris became the center of the new monarchy.

The first task of the Capetian line was to reconquer the royal prerogatives from the great vassals, but for two centuries without much success. Hugh Capet died in 996, and his first three successors, Robert (died 1031), Henry I (died 1060), and Philip I (died 1106), effected nothing whatever towards the establishment of the royal authority. Louis VI was more successful, being greatly helped by the fact that the nobility had been much weakened by the Crusades. The growth of the towns also, which ultimately became the allies of the kings, was a powerful check on the nobles.

Louis VI died in 1137, and was succeeded by his son Louis VII, who reigned till 1180. During his reign the stability of the French throne was endangered by the influence acquired in France by Henry II of England, who came into possession by inheritance and by his marriage with Eleanor of Aquitaine of the whole of the west of France except Brittany. Louis was succeeded by his son Philip Augustus (Philip II), who did much to strengthen the throne, and deprived John, the king of England, of Normandy, Maine, and Anjou. His son Louis VIII, who succeeded in 1223, carried on the work by the conquest of Poitou, and a religious war being proclaimed against the Counts of Toulouse, who protected the Albigenses, that house was extinguished, and their domains passed to the royal family. Louis VIII died in 1226, and under the wise rule of Louis IX (St. Louis) the influence of the crown went on increasing, as it did also under Philip (III) the Bold (died 1285), Philip (IV) the Fair (died 1314), Louis X (died 1316), John I (died 1316, after a reign of five days), Philip V (died 1322), and Charles IV (died 1328), by the acquisition of fresh domains and other means until the outbreak of the wars with England.

The first branch of the Capetian line of kings became extinct on the death of Charles IV, the last of the sons of Philip the Fair, the Salic law excluding the female succession. The crown thus fell to Philip of Valois, a cousin, who became king as Philip VI. His claim was disputed by Edward III of England, and the dispute led to a series of wars which

were not terminated for more than 120 years. During this period France was reduced to a state of great misery. While Edward, victorious over Philip VI, and after his death over John (II) the Good, who was taken prisoner at Poitiers in 1356, compelled the surrender to England of some of the finest provinces of France by the Treaty of Brétigny in 1360, the country was plundered by banditti, and the Jacquerie, a mass of furious peasants (about 1358), satiated their spirit of vengeance in the blood of the nobility. Charles (V) the Wise, who succeeded John the Good in 1364, and his constable, Du Guesclin, were able to restore order only for a short time, although during this reign the English were driven out of most of their possessions in France. Then came the long and unhappy reign of the imbecile Charles VI (1380-1422), during which Henry V of England, reviving the claim of Edward III to the French crown, invaded France, won the field of Agincourt, and obtained a treaty (Treaty of Troyes) acknowledging the right of succession to the French crown in himself and his descendants. Charles VI died in 1422, a few weeks after Henry V, whose son, Henry VI, a minor, was acknowledged as king by the greater part of France. But between 1429 and 1431 the remarkable peasant girl, JOAN OF ARC, animated the French in the cause of the dauphin, who was crowned as Charles VII at Rheims in 1429, and in 1451 the English had lost all their possessions in France, except Calais. The political shrewdness and perfidy of Louis XI (1461-83) completed the subjugation of the great barons, and laid the foundation of absolute monarchy. Maine, Anjou, and Provence were left to him by the will of the last count, and a large part of the possessions of the Duke of Burgundy, including Picardy, Artois, the duchy of Burgundy proper, and Franche Comté, all came into his hands not long after the death of Charles the Bold, in 1477. His son and successor, Charles VIII (1483-98), united also Brittany to the crown by his marriage with Anne, the heiress of the fief, and effected a conquest of Naples, which lasted but a short time.

Charles was the last king of the direct line of Valois, which was succeeded by the collateral branch of Valois-Orleans (1498), in the person of Louis XII, who was descended from Louis of Valois, Duke of Orleans, brother of Charles VI. In order to keep Brittany attached to the crown he married the widow of his predecessor. On his death the crown reverted to another branch of the house of Valois, that of Angoulême, Francis I (1515-47) being the grandson of John, Count of Angoulême, uncle of Louis XII. Francis I, still continuing the attempts at conquest in Italy, was brought into conflict with Charles V of Germany, who also claimed Milan as an imperial fief. The result was five wars between France and Germany, in the first of which Francis had to retreat across the Alps; in the second he was taken prisoner at Pavia; in the third he seized Savoy and Piedmont, which the Peace of Crespy (1544), made at the conclusion of the fourth war, allowed him to keep.

Francis I died in 1547, and his son, Henry II (1547-59), pursuing the same policy, renewed the war for the fifth time with the house of Hapsburg. In the Peace of Cateau-Cambrésis (1559), with which it ended, Henry had to surrender Savoy and Piedmont, but remained in possession of the German bishoprics of Metz, Toul, and Verdun. The year before, Calais, the last English possession in France, had been captured by Francis, Duke of Guise. Francis II, the husband of Mary Queen of Scots, succeeded his father Henry, but reigned little more than a year (1559-60). The foundation of the national debt, the weight of which broke down the throne 250 years later, was laid in this period. Intrigue and corruption gave to women a dangerous influence at court and in public affairs. Under the administration of Charles IX (conducted during his minority by the queen-mother, Catharine de' Medici) France was inundated with the blood of Frenchmen, shed in the religious wars from 1562. (See *Bartholomew's Day.*) These continued throughout the reign of Charles IX and his successor, Henry III (1574-89), and were only terminated when Henry IV originally King of Navarre, and since the death of Henry III King of France, went over to the Catholic Church (1593), having hitherto been the leader of the Huguenots.

Henry IV was the first French sovereign of the house of Bourbon, which inherited its right to the throne from a son of Louis IX. He united to the crown of France the Kingdom of Navarre, which he had inherited from his mother, Jeanne d'Albret. In his government of France Henry showed all the qualities of a great prince and a great statesman, establishing religious toleration (Edict of Nantes, 1598), and laboring diligently for the welfare of the state. He was cut off prematurely by the dagger of the fanatic Ravaillac (1610). During the minority of Henry's son,

Louis XIII, the French policy was at first wavering, until the prime-minister, Cardinal Richelieu, gave it a steady direction. He restored the French influence in Italy and the Netherlands, humbled Austria and Spain, and created that domestic control which rendered the government completely absolute.

Louis XIII died in 1643, the year after his great minister, and was succeeded by Louis XIV, 'le Grand Monarque.' The policy of Richelieu was carried on by Mazarin during the regency of Anne of Austria, while Louis was still a minor, and also for some years after Louis was declared of age. During his ministry France obtained by the Peace of Westphalia (1648) the German province of Alsace and by the Peace of the Pyrenees (1659) parts of Flanders, Hainault, Luxembourg, etc. After the death of Mazarin, in 1661, Louis XIV took the government into his own hands, and ruled with an absolute sway. The period which immediately followed was the most brilliant in French history. His ministers, especially Colbert, and his generals, Turenne, Condé, Luxembourg, and the military engineer Vauban, were alike the greatest of their time; the writers of the period were also among the greatest in French literature. An unsuccessful attempt was made on the Spanish Netherlands; a war was undertaken against Holland, Spain, and Germany, which ended in France receiving Franche Comté and other places from Spain and Freiburg from Germany. In 1681 Strasbourg was seized from the empire in a time of peace. The last war of Louis was the war of the Spanish Succession (1701-14), which resulted unfortunately for France. During this reign great injury was done to French industry by the revocation of the Edict of Nantes in 1685. Louis XIV died in 1715, leaving the finances in disorder, and a national debt amounting to no less than 4,500,000,000 livres. Louis XV, the grandson of Louis XIV, succeeded at the age of five years. During his minority the regent, the Duke of Orleans, squandered the revenues in the most reckless manner, and matters went from bad to worse. In 1723 Louis was declared of age, but he sank under the pernicious influences of mistresses, like Pompadour and Du Barry, into extravagance and license, entering into useless and costly wars (war of Austrian Succession, 1740-48; Seven Years' war, 1756-63), and contracting enormous debts. During his reign two important acquisitions were made by France, namely, Lorraine and Corsica.

With the reign of Louis XVI began the period of expiation for the misdeeds of the French monarchy and aristocracy, which had culminated in the preceding reign. The king himself was amiable, but the whole administration was rotten, and the court, the nobility, and the clergy formed only one privileged class united to oppress the people. The good intentions of Louis were neutralized by a total lack of energy and firmness. The first difficulty of his government, and the rock on which it split, was the hopeless condition of the public finances, with which Turgot, Necker, Calonne, Brienne, and again Necker tried in vain successively to grapple. Finding all ordinary measures unavailing, Necker demanded the convocation of the States General, which had not met since 1614. They met on 5th May, 1789, but as the nobles and clergy refused to conduct business so as to give the Third Estate its due weight, the deputies of this body assumed the title of the National Constituent Assembly, and resolved not to separate till they had given a constitution to France. The clergy and nobles then yielded, and the fusion of the three orders was effected on 27th June. Foreign troops, however, were brought to Paris to overawe the assembly. The people now demanded arms, which the municipality of Paris supplied; and on 14th July the Bastille was captured and destroyed. Lafayette was made commander of the newly-established national guard. On the 4th August a decisive step was taken by the abolition of all feudal rights and privileges. On 5th October Versailles was attacked by the mob, and the royal family, virtually prisoners, were taken to Paris by Lafayette. The king tried to obtain the aid of some of the foreign powers against his subjects, and made his escape from Paris (20th June, 1791); but he was recognized, arrested at Varennes, and brought back to Paris. On 30th September, 1791, the assembly brought its work to a finish by producing a new constitution, which was sworn to by the king on 14th September, and he was then reinstated in his functions. This constitution deprived the king of arbitrary powers, provided liberty of worship and freedom of the press, of commerce, of industry; abolished the laws of primogeniture and entail as well as titles; all France was redivided into eighty-three departments, nearly equal in extent.

The Constituent Assembly was, according to the constitution, immediately followed by the Legislative Assembly, which met October 1, 1791, and in which

there were two parties of political importance, the Girondists, moderate republicans, so named because their leaders came from the department of the Gironde, who led it, and the Montagnards, extreme radicals, known collectively as the Mountain, because their seats were the highest on the left side of the hall, who subsequently became all-powerful in the convention. The constitutionalists and monarchists were already powerless. The declaration of Pilnitz by the Emperor of Germany and the King of Prussia, threatening an armed intervention on behalf of the king, compelled the assembly to take a decisive course, and on 20th April, 1792, war was declared against Austria and Prussia. Reverses to the French troops caused a popular rising, and the Tuileries, after a sanguinary combat, were taken and sacked. The king took refuge with his family in the Assembly, which was invaded and compelled to submit to the dictation of the victors by assenting to the suspension of the king and the convocation of a National Convention in place of the Assembly. The first act of the Convention was to proclaim a republic. On 3d December the king was cited to appear before it. On 20th January, 1793, he was sentenced to death within twenty-four hours, and on the 21st the sentence was executed. This violent inauguration of the republic shocked public opinion throughout Europe, and armed the neutral states against France. England, Holland, and Spain joined the coalition. The extremists in France only grew more violent, a committee of public safety, with sovereign authority, was appointed 6th April, and the Reign of Terror begun. The struggle between the Girondists and the Montagnards or Jacobins terminated in favor of the latter. A new constitution was adopted by the Convention on 23d June, called the Constitution of the Year 1, the Republican Calendar being adopted on 5th October, 1793, the year 1 beginning on September 22, 1792. Christianity was formally abolished. Risings against the government were put down with frightful bloodshed. Both in Paris and the provinces executions and massacres of persons alleged to be disaffected to the party in power followed each other daily. The queen was executed on 16th October, 1793, the Girondists on 31st October, and others followed, Robespierre being foremost in the bloody work. At length the reign of terror came to an end by the execution of Robespierre and his associates on 27th and 28th July, 1794. Danton and Hébert, his old allies, he had already brought to the scaffold. Marat, another man of blood, had perished by assassination. The campaigns of 1793 and 1794 resulted favorably to the French arms, which were carried beyond the French frontier, Belgium and Holland being occupied, Spain being invaded, and the allies being driven across the Rhine. These successes induced Prussia and Spain to sign the treaties of Basel (1795), recognizing the French republic. In 1795 the Convention gave the republic a new constitution, a chamber of *Five Hundred* to propose the laws, a chamber of *Ancients* to approve them, an executive of five members, one elected annually, called the *Directory*. The Convention was dissolved on 26th October.

Napoleon Bonaparte now began to be the most prominent figure in French affairs; and after his brilliant successes against the Austrians both north and south of the Alps, and his empty conquest of Egypt, it was not difficult for him to overthrow the government of the Directory. This was accomplished in the revolution of 18th and 19th Brumaire (9th and 10th November, 1799), the Directory being succeeded by the Consulate, Bonaparte himself being appointed *First Consul* for ten years. The other two consuls, Cambacérès and Lebrun, were to have consultative voices only. The new constitution (constitution of the year VIII. originally devised by Siéyès) was proclaimed the 15th December. Under the appearance of a republic it really established a military monarchy. The history of France for the next sixteen years is virtually the history of Napoleon. (*See Napoleon I.*) In 1802 the constitution was amended, Napoleon being made consul for life, with the right of appointing his successor. In 1804 he was proclaimed emperor, this being confirmed by a popular vote of 3,572,329 against 2569. The emperor was consecrated at Paris by Pius VII, and in 1805 he was also crowned King of Italy. For years the continental powers, whether singly or in coalitions, were unable to stand against him, though at sea France was powerless after the great victory by Nelson over the French and Spanish fleets at Trafalgar (1805). The Austrians and Russians were decisively defeated at the great battle of Austerlitz (1805); the King of Naples was dethroned and Napoleon's brother Joseph was put in his place; another brother, Louis, was made King of Holland; while for a third, Jerome, the Kingdom of Westphalia was erected (1807). Prussia was conquered and compelled to accede to humiliating terms. Napoleon was at the height of his power in 1810 and 1811, his empire then extending from

Denmark to Naples, with capitals at Paris, Rome, and Amsterdam. By this time, however, the Peninsular War (see that art.) had broken out, which was one immediate cause of his downfall, the disastrous Russian campaign of 1812 being another. The latter cost the French the loss of at least 300,000 men. A new coalition was now formed against Napoleon, and in 1813 he was disastrously defeated by the allies at the great battle of Leipzig. By this time the Peninsular War was drawing to a close and Southern France was actually invaded by Wellington. The allies entered Paris on 31st March, 1814. Napoleon abdicated and received the island of Elba as a sovereign principality. Louis XVIII was proclaimed King of France, and concluded the Peace of Paris (May 30, 1814). A congress of the great powers had assembled at Vienna to adjust European affairs, when it was announced that Napoleon had left Elba, returned to Paris, 20th March, 1815, and been reinstated without resistance in his former authority. The allied sovereigns proclaimed him an outlaw and renewed their alliance against him. Napoleon, anticipating the attack, crossed the Sambre with 130,000 men, defeated Blücher in the battle of Ligny, and marched against the British, who had taken position at Waterloo. Here, on the 18th, was fought the decisive battle which resulted in his final overthrow. On the 7th July the allies entered Paris for the second time. Napoleon surrendered to the British and was sent to St. Helena as a prisoner.

Louis XVIII at first governed with the support of a moderate Liberal party, but the reactionary spirit of the aristocrats and returned émigrés soon got the upper hand; the country, however, was prosperous. Louis died 16th September, 1824, and his brother, Charles X, succeeded. On 26th July, 1830, the Polignac ministry, strongly reactionary in its tendencies, published ordinances suppressing the liberty of the press and creating a new system of elections. The result was an insurrection during the three days, 27th-29th July, by which Charles X was overthrown and Louis Philippe of Orleans proclaimed king, 9th August, 1830. During the last days of Charles X's reign a French expedition had captured the city of Algiers and laid the foundation of the French colony there. During the eighteen years of Louis Philippe's reign the chief events were the taking of the Citadel of Antwerp, the temporary occupation of Ancona, both in 1832, and in 1835 the completion of the conquest of Algeria. But later, under the ministry of Guizot, a policy of resistance to all constitutional changes was adopted, and a strong opposition having been formed, on 24th February, 1848, another revolution drove Louis Philippe into exile. A republic was proclaimed, and on the 10th December, 1848, Louis Napoleon, nephew of the great Napoleon, was elected president for four years. The president, having gained the favor of the army, dissolved the legislative assembly on 2d December, 1851, put down all resistance in blood, and by this *coup d'état* established himself as president for the further term of ten years. A plébiscite of 7,839,216 votes confirmed the appointment. On 2d December the president was declared emperor under the title of Napoleon III (a son of the great Napoleon being counted as Napoleon II); and a plébiscite of 7,824,129 votes was again got to confirm the appointment. The Crimean War (1854-55) and the war against Austria on behalf of Italy (1859) distinguished the early part of his reign. The latter greatly aided in the foundation of a United Italy, and gave France the territories of Savoie and Nice (1860). In 1870 the uneasiness of Napoleon and the French at the steady aggrandizement of Prussia broke out into flame at the offer of the Spanish crown to a prince of the house of Hohenzollern. Napoleon, not satisfied with the renunciation of the German prince, demanded a guarantee from the King of Prussia that the candidature should never be resumed. This being refused, he declared war. (See *Franco-German War.*) One French army was driven back by the Germans and cooped up in Metz, another was pushed northwards to Sedan, and so hemmed in that it had to surrender with the emperor at its head. On the news of this disaster reaching Paris the republic was proclaimed. After an almost uninterrupted series of victories the Germans became masters of the French capital (28th January, 1871), and the war ended in France giving up to Germany Alsace and a part of Lorraine, and paying a war indemnity of five milliards of francs ($1,000,000,000). Meanwhile civil war had broken out in Paris, which was suppressed with great difficulty. (See *Commune of Paris.*) The assembly elected in 1871 for the ratification of peace with Germany found it expedient to continue their functions. Thiers being the head of the administration. In 1873 the Thiers administration was overthrown and replaced by one under Marshal MacMahon. In 1875 a republican constitution was drawn up. In 1879 MacMahon resigned his presidentship, be-

ing succeeded by Jules Grevy, who in turn was followed by Sadi-Carnot in 1887. Carnot was assassinated in 1894, and was succeeded by Casimir-Perier as president, who resigned January 15, 1895. Two days later Félix Faure succeeded him. During his term of office France was violently agitated by the Dreyfus case, and had a dispute with England about Fashoda, Soudan. Faure died suddenly, February 15, 1899; succeeded by Emile Loubet. Armand Fallières was elected president January 17, 1906. The hostile feeling between Germany and France due to French extension in the Soudan was brought to a head in 1911 as a result of an outbreak of rebel tribesmen. An active dispute arose, which was finally settled by France's giving Germany a large tract of land in the region of French Congo. Raymond Poincaré succeeded M. Fallières as president, Jan. 17, 1913. In 1914 France entered the European War against Germany and Austria, supported by her allies, Russia and Britain.

Of these nations the situation of France was the most critical. Hostile sentiment had existed between that country and Germany since the war of 1870-71, the loss of Alsace-Lorraine being the most bitter pill which for centuries France had been forced to take. As regards the military conditions of these two countries, the difference was by no means so great as it had been in the previous war. The statesmen of France had taken care that the army of that country should not again be found in the unfit state in which it proved to be when Napoleon III, in 1879, flung down the gage of battle against Prussia and its German allies. But, in 1914, no other country in the world had become so complete a fighting machine or had such a splendid equipment of military material as the Prussia of that date, and the kaiser of the new German empire was not without warrant for the confidence with which he defied the combined powers of France, Great Britain and Russia. It was his first aim to invade and overcome France before any efficient aid could reach it from its allies, and, avoiding the French line of defense, he poured his battalions into Belgium and across the French-Belgian frontier with all possible haste. Yet small and weak as Belgium was, it courageously held back the German armies long enough to give France an opportunity to get its forces into the field and for a small contingent of British troops to come to its aid.

Mobilization began in France at midnight of August 2, 1914, and by the time the German army had reached the French frontier there was a large army ready to meet it. That the kaiser and his military advisers expected to take the French by surprise and paralyze their armed forces as had been done in 1870 is highly probable, but they found them well equipped and ably commanded, and though they were forced to retreat before the irresistible advance of the German forces, this was done slowly and stubbornly. The small British contingent at Mons was struck in late September, and saved itself only by a hasty retreat, and the much stronger French army was soon being driven back. This continued until the foe was only a few miles distant from Paris. But the French commander, Marshal Joffre, was simply making a strategic retreat, and on September 6 checked his army, brought up the considerable force that held the forts around Paris and made so vigorous an assault upon the enemy that the tables were turned and the Germans, in turn, forced to retreat. For the details of this signal victory, one of the most notable in the whole war, see *Marne, Battle of the.* It put an end to the advance of the Germans, forced them to retreat day after day, until the line of the Meuse was reached, and put a final end to the forward movements of the German armies in the western section of the vast field of warfare.

The French forces had, meanwhile, entered Alsace and made some progress in that section. But the tide of war soon swept further to the west and efforts to regain this coveted territory ceased. For important military events we must now go forward to the spring of 1915, when the augmented British forces fought gallantly, though not victoriously, at Ypres and Neuve Chapelle, and the French in the Artois region, the latter a tremendous though not successful effort to break the strongly held German lines. But the most striking and long contested of the efforts in this section of the far-extended field of battle was the desperate effort of the army under the Crown Prince of Germany to capture the stronghold of Verdun and open in this direction a new route of advance on Paris. This great struggle continued for months, the German army losing heavily in its charges on the outlying defenses of the stronghold. Some of these were taken, yet the French held firmly to their fortress, and in the end, after a struggle of well nigh a year's duration, regained all the lost ground. It was a terribly costly enterprise, in men and munitions, on the part of Germany, and the last strong effort made by them to

defeat the valiant armies and win any of the strongholds of France. In this direction they had utterly failed to repeat their success of 1870, and during the remainder of the war, in this section, all the strength of the German forces was given to the desperate and fruitless attempt to hold back their foe. In the succeeding years of the war the armies of France fought bravely in the various new encounters against the long extended lines of German trenches, and while victory clung to their banners, it was at a frightful cost in men and money. In picturesque expression, France was being 'bled white,' and the peril was growing that their struggle might end in sheer exhaustion. At this critical era help from their new ally over the seas, the United States, began to reach the plains of France and new vitality and hope were given in the struggle they still valiantly continued. At the close of 1917 General Pershing had under his command in France a considerable body of American soldiers, in great part trained and ready for service in the trenches.

France, LANGUAGE OF. At the time of the conquest of Gaul by Julius Cæsar, the principal dialects spoken by the inhabitants were Celtic. After the conquest of Gaul by the Romans all these dialects were gradually supplanted by Latin, except in Brittany, where a Celtic dialect still holds its ground. The popular Latin of Gaul, of course, exhibited considerable differences from the written and classical Latin, and by the seventh or eighth century the literary and the popular languages had come to be quite clearly distinguished as the *Latina* and the *Romana*, respectively. Besides the Celtic words, not very numerous, which were included in the new speech, it was considerably modified by Celtic habits of speech, new sounds being introduced. It was still further modified by the influences introduced with the Teutonic invasions. After the Franks in Gaul had abandoned their native language and adopted this new Romanic or Romance tongue it became known as the *Francisca*, later *Française*. The oldest known monument of the new dialect is the oath of Louis the German, taken at Strasburg, in 842. In the ninth and tenth centuries two main branches or groups of dialects came to be recognized, the *Langue d'Oc*, spoken in the districts south of the Loire, and the *Langue d'Oil*, spoken in the provinces of the north and the east. In the thirteenth century the Langue d'Oil, spoken in the central province of Ile de France, where the capital, Paris, was, came to be regarded as the classical language of the country, all other dialects sinking into the condition of *patois*. At the beginning of the sixteenth century Francis I prohibited the use of Latin at court and in the public tribunals and formally recognized the French as the national language. As one of the Romance languages it is a sister tongue of Italian, Spanish, and Portuguese.

France, LITERATURE OF. French literature proper begins in the eleventh century with the epic or narrative poems known as *chansons de geste*, and produced by the class of poets known as *Trouvères*. These poems belong to Northern France and are very numerous. They are usually divided into three heads: poems relating to French history, in particular to the deeds of Charlemagne, his descendants and vassals; poems relating to Alexander the Great and to ancient history; and poems of the Arthurian cycle, or relating to King Arthur. They are generally written in verses of ten or twelve syllables, and are of a length varying from 1000 to 20,000 lines. One of the oldest and best examples of the first class is the *Chanson de Roland*, or *Song of Roland*. Of the Arthurian cycle, the *Roman de Rou* and *Roman de Brut;* and of the Alexandrine cycle, the *Alexandre* by Lambert li Cors, and *La Guerre de Troie* ('War of Troy'), by Benoît de St. More, are examples. Out of the *chansons de geste* grew the *romans d'aventures*, poems of fiction which are not connected with any of the well-defined topics of the *chansons de geste*. Distinct from these are the *fabliaux*, metrical tales of a witty and sarcastic kind, belonging mostly to the twelfth and thirteenth centuries. Allied to these is the *Roman de Renard*, or *History of Reynard the Fox*, a poem, or rather series of poems, written between the end of the twelfth and the middle of the fourteenth century, and forming a satirical picture of all the classes and institutions of the time.

Side by side with these epics, romances, and tales an abundant lyric poetry flourished from the eleventh century. This song literature is mainly of a sentimental character, and is usually divided into two classes, *romances* and *pastourelles*. It is in general remarkable for its lyric grace and skillful melody. Its writers, known in literature as Troubadours, were very prolific. The first known of these was Guillem IX, count of Poitiers, near the end of the eleventh century, their most brilliant period being during the second half of the twelfth and the first half of the thirteenth centuries. The list of Troubadours numbers about 400 in all,

love being the leading topic of their poems, Peire Vidal and Bertrand de Born are among the best known of them, while Guiraut Riquier, near the close of the thirteenth century, is spoken of as 'the last of the Troubadours.' Their language was the melodious Provençal of the South. Amongst the principal of the early lyrists are Thibaut de Champagne (1201-53), Charles of Orleans (1391-1465). The latter, a graceful writer of ballades and rondels, was amongst the last of the real Trouvères. Rutebeuf (born 1230), also a writer of fabliaux, is the first of a series of poets, culminating in François Villon, who passed their life in a bohemian alternation of gaiety and misery, celebrating each phase with equal vigor in verse. The *Roman de la Rose*, the work, in its earlier part, of Guillaume de Loris, who lived in the first half of the thirteenth century, in the later, of Jean de Meung (died 1320), is one of the most notable productions of the time. It consists of more than 22,000 verses, and is a curious combination of a love poem and a satire. Olivier Basselin (who died about 1418) wrote songs celebrating the praises of wine. François Villon (1431-1500), the greatest of French poets before the Renaissance, wrote two compositions known as the *Great* and the *Little Testament*, interspersed with lyrical compositions of great poetic merit.

In prose literature the first important work is the *Histoire de la Conquête de Constantinople*, by Villehardouin (1167-1213). The *Mémoires* of the Sieur de Joinville (1223-1317) delineates the life of St. Louis and the exploits of the last Crusade. Froissart (1337-1410), the 'Herodotus of his age,' gives a vivid picture of the chivalry of the 14th century. With Philippe de Commines (1445-1509) we are introduced to Louis XI, and his contemporaries in a style of history which, if less naïve and charming, shows a deeper and more philosophical sense of things. In the lighter prose the *Cent Nouvelles Nouvelles* already shows the capacity of the French language for the short, witty tale.

The revival of classical learning and the reformation of religion exercised a powerful influence on the French literature of the sixteenth century. Rabelais (1483-1553), a profound but often gross humorist, and Montaigne (1533-92), an interesting and instructive, though somewhat skeptical essayist, hold the first rank. Calvin (1509-64) did much by his great theological work, *Institution de la religion Chrétienne*, to mold French prose in the direction of strength and gravity. Amongst the other works which indicate the rapid development of French prose in this century are Brantôme's *Mémoires*, the *Heptaméron* of Queen Margaret of Navarre (1492-1549), the translations by Amyot (1513-93) of Plutarch and other classical writers, and the celebrated political pamphlet, *Satire Ménippée*. In poetry Clement Marot (1497-1544) gave a new elegance to the language in his epistles and epigrams. Pierre de Ronsard (1524-85) and the other members of the celebrated *Pléiade*, Iodelle, Belleau, Dubellay and others, sought to enrich their native tongue by the introduction of classical words, constructions, and forms of verse. Du Bartas (1544-90) and D'Aubigné (1550-1630) carried on the work of Ronsard. Mathurin Régnier (1573-1613) may be said to close this school of poetry. He unites in himself the lighter qualities of the style of Villon and Marot with the erudition and command of language characteristic of the Ronsardists. Malherbe (1556-1628), the creator of a new taste in literature, opposed with success the tendency of the Ronsard school, and falling into the opposite excess sacrificed everything to correctness. It was his school that set the example of the smooth but monotonous Alexandrine. With the Renaissance translations of the classical dramas appeared, and a member of the *Pléiade*, Jodelle (1532-1573), wrote the first regular tragedy (*Cléopatre*) and comedy (*Eugène*).

The seventeenth century opened with Alexandre Hardy (1560-1631), Rotrou (1609-50), Tristan (1601-55), Mairet (1604-88), Du Ryer (1605-48), and a host of other dramatists, for nearly a hundred can be enumerated in the first quarter of the century. At length Pierre Corneille (1606-84), with his *Cid*, *Cinna*, *Horace*, and *Polyeucte*, brought French tragedy to a degree of grandeur which it has not surpassed. Of seventeenth century prose writers Pascal (1628-62) is vigorous and satirical in his *Lettres provinciales;* profound, if sometimes mystical, in his *Pensées*. The letters of Balzac (1584-1684) and Voiture (1598-1648), though rhetorical, were valuable as models for elegant prose. Descartes (1596-1650) showed in his *Discours sur la Méthode* that the language was now equal to the highest philosophical subjects, and the great work of his disciple, Malebranche, *Recherche de la Vérité* is equally admirable for its elegance of style and its subtlety of thought.

The age of Louis XIV is known as the golden age of French literature. Besides Corneille, Racine (1639-99) represented

the tragic drama, and Molière (1639-93) brought his great masterpieces of comedy on the stage. The 'inimitable' La Fontaine (1621-95) wrote his *Contes* and the most charming collection of fables. For his critical influence, if not for his poetry, Boileau (1636-1711) holds a prominent place. In eloquence the sermons and funeral orations of Bossuet, Bourdaloue, and Massillon take the first rank. Bossuet is also celebrated as a controversialist and theological historian. Very important, too, are the memoir and maxim writers of this time. Amongst the former are the Cardinal de Retz, Madame de Motteville, Madame de Sévigné (1627-96), and others; amongst the latter are La Rochefoucauld (1613-80), St. Evremond (1613-1703), La Bruyère (1639-99). In fiction Le Sage, who also wrote comedies, produced his immortal *Gil Blas* and the *Diable Boiteux;* and the versatile Fontenelle wrote his *Dialogues des Morts.*

Amongst the writers of the eighteenth century Voltaire holds the first place. He claims notice as an epic, lyrical, and comic poet, as a tragic and comic dramatist, as a historian, novelist, and philosopher, and he remained at the head of the republic of letters for more than half a century. Next to him in immediate influence on the age stands Jean Jacques Rousseau (1712-78), a writer of an eloquent sentimental vein, well represented by his *Nouvelle Héloïse* and his famous *Confessions.* His new theories of politics and education are embodied in his *Contrat Social* and *Emile.* Buffon (1707-88) devoted himself to the production of his immense natural history. Montesquieu (1689-1755), commencing with the *Lettres Persanes,* a satire on French manners and government, followed with a historical masterpiece, *Considérations sur la Grandeur et la Décadence des Romains,* and finally with his great work, the *Esprit des Lois.* Diderot (1713-83), a powerful and suggestive writer in many departments, and D'Alembert (1717-83), a great geometrician, founded the *Encyclopédie,* a vast review of human knowledge, often hostile to social order and always to religion. Amongst the philosophers Helvetius, D'Holbach, and La Mettrie represent the extreme materialistic and anti-Christian school. Condillac and Condorcet kept most on the side of moderation. Among the writers of fiction Bernardin de St. Pierre (1737-1814), author of *Paul et Virginie,* and Prévost (1697-1763), author of *Manon Lescaut,* are particularly worthy of mention; while dramatic literature was enriched by the *Barbier de Séville* and the *Mariage de Figaro* of Beaumarchais (1732-99). The age was not poetical; poetry had degenerated into imitations of foreign descriptive poets, such as Thomson. The most successful writer of this stamp was Delille (1738-1813). André Chénier (1762-94), the most promising of all, fell beneath the guillotine just after completing his *Jeune Captive.*

Neither the revolution nor the first empire was favorable to literature. Châteaubriand (1768-1848) and Madame de Stael (1766-1817) gave a new turn to the taste and sentiment of the time, the former in his *Génie du Christianisme* and his *Martyres,* clothing the history of Christianity in the romantic hues of his imagination, the latter in her *Corinne* and *De l'Allemagne* introducing the idealistic spirit and thought of the Germans to her countrymen. A purely reactionary school of thought was headed by Joseph de Maistre (1754-1821), the advocate of theocracy, with a vigorous despotism for its system of government.

Later on in the nineteenth century the influence of Goethe, Schiller, Shakespere, Scott, and Byron began to be felt, and a new school, called the *romantic,* as opposed to the old or *classic,* sprung up, headed by Victor Hugo (1802-85), who promulgated the new theories in the preface to his drama of *Cromwell,* and carried them into practice in numerous poems. The most notable of his associates were Alfred de Vigny (1779-1863), author of a volume of *Poëmes,* and of a novel, *Cinq Mars;* Sainte-Beuve (1804-69), who published several volumes of poetry in those early days, but became famous later on as a critic, perhaps the best France has ever possessed; Alfred de Musset (1810-57), who produced some of the finest lyrics in the language. Charles Nodier, Gérard de Nerval, the two Deschamps, and, later, Théophile Gautier, with others, also belonged to the band of romanticists. On the stage the dramas of Alexandre Dumas, the elder (1803-74), though melodramatic and of inferior literary value, served as rallying points for the new school. To English readers, however, he is best known by his novels. A reactionary movement was attempted, led by Ponsard (1814-67) and Emile Augier (1820-89). Casimir Delavigne (1793-1843) attempted to combine the classic and romantic schools; and Lamartine (1790-1869) is more than half a romanticist by sentiment and style. Béranger (1780-1857), the greatest of French song-writers, may be considered as belonging to neither of the two schools, nor can the sparkling comedies and vaude-

villes of Eugène Scribe be claimed by any of the rival parties.

Among novelists Balzac (1799-1850), by his astonishing series of works, *La Comédie Humaine*, has established his claim to first place. The novels of George Sand (1804-76), showed delightful style and an optimistic outlook upon life. Eugène Sue (1804-57), gained popularity through his *Mysteries of Paris* and *Wandering Jew;* while Henry Beyle ('Stendhal') launched the first psychological novels. Prosper Merimée (1803-79) is chiefly known by his *Colomba*, a tale of the Corsican vendetta. Gustave Flaubert (1821-80) combined romanticism and realism and may be called the father of the modern realistic or 'naturalist' school, of whom Emile Zola (1840-1903), Alphonse Daudet (1840-97), and Edmond (1822-97), and Jules (1830-70), de Goncourt are the chief exponents. Guy de Maupassant (1850-92) is the greatest master of the short story. Of later writers Anatole France (born 1844), stands first, though Julien Viand ('Pierre Loti'), Edouard Rod (1857-1909), Ferdinand Fabre (1830-98), and René Bazin (born (1853) deserve mention.

In works of history the nineteenth century was very prolific, the leading historians being Michaud (1767-1839), Sismondi (1773-1842), Guizot (1787-1874), Amédée Thierry (1787-1873), Augustine Thierry (1795-1856), Mignet (1796-1884), Thiers (1797-1877), Michelet (1798-1874), Henri Martin (1810-83), Victor Duruy (1811-1894), Louis Blanc (1813-82). Literary historians are: Villemain (1790-1870), Vinet (1797-1847), J. J. Ampère (1800-64), Littré (1801-81), St. Marc-Girardin (1801-73), Sainte-Beuve (1804-69), Taine (1828-1893). Philosophy is represented by Lamennais (1782-1854), Victor Cousin (1792-1867), Jouffroy (1796-1842), Rémusat (1797-1875), Auguste Comte (1798-1857), Quinet (1803-75), Montalembert (1810-70), Renan (1823-1892). Among the writers on political economy and sociology are Bastiat (1801-50), Tocqueville (1805-59), Chevalier (1806-79), Proudhon (1809-65), Jules Simon (1814-1896), Prévost Paradol (1829-70). Among scientific writers are: Etienne Geoffroy St. Hilaire and his son Isidore, Cuvier, Jussieu, Duméril, in natural science; Gay-Lussac, Bichat, Corvisart, Magendie, in chemistry and medicine; and Lagrange, Laplace, and Arago in mathematics. Amongst Orientalists of note are Champollion, Burnouf, Silvestre de Sacy, and Stanislas Julien. The essayists and literary and art critics are legion. We can only mention by name Théophile Gautier, Jules Janin, Philarète Chasles, Léon Gozlan, Paul de St. Victor, Gustave Planche, and St. René Taillandier. Among poets who belong to a date posterior to the Romantic movement, or show different tendencies, may be mentioned Gautier in his later poetry, Charles Baudelaire, Leconte de Lisle, François Coppée, Paul Verlaine, Stéphane Mallarmé, Sully Prudhomme, and Catulle Mendes.

France, Isle of (*Ile-de-France*), an ancient province of France, so called because it was originally bounded by the Seine, Marne, Ourcq, Aisne, Oise, and formed almost an island.

France, Isle of. See *Mauritius.*

France, Jacques Anatole Thibault, French novelist, born in Paris in 1844. Among his best-known works are *Le Crime de Sylvestre Bonnard* (1881), *Thais* (1890), *Le Mannequin d'Osier* (1893), and *L'Histoire Contemporaine*, the fourth volume of which treats of the Dreyfus affair.

Francesca da Rimini (frân-ches'kȧ dȧ rē'mi-nē), an Italian lady, daughter of Guido da Polenta, lord of Ravenna, lived in the latter part of the thirteenth century. She was married to Lanciotto, the deformed son of the lord of Rimini, who, discovering an intimacy between her and his brother Paolo, put both to death. The story is a favorite theme with poets.

Franche-Comté (frȧnsh-kon-tā), an ancient province of France, forming at present the departments of Doubs, Haute-Saône, and Jura. It formed part of the Kingdom of Burgundy.

Franchise (fran'chīz), in a general and legal sense, a particular privilege or right granted by a prince, sovereign, or government to an individual, or to a number of persons. In politics, in regard to which the term is most commonly used, it is the right of voting upon proposed legislative measures, where such measures are accepted or rejected by the people generally; or for representatives to a legislative assembly (the parliamentary franchise) or to a municipal body.

Francia (frân'se-ȧ José Gaspar Rodriguez, Dictator of Paraguay, born in 1758; died in 1840. When Paraguay threw off the Spanish yoke, he became secretary of the junta appointed by congress. In 1814 he was appointed dictator for three years, and in 1817 he was continued in authority for life. He did much to consolidate the new republic;

but his rule was arbitrary in the extreme. In spite of his cruelty and rigor he was generally beloved by his subjects.

Francis I (fran'sis), King of France, was born 1494; died 1547. His father was Charles of Orleans, Count of Angoulême, and his mother Louise of Savoy, granddaughter of Valentine, Duke of Milan. He ascended the throne in 1515, having succeeded his uncle, Louis XII. In prosecution of his claim to Milan he defeated the Swiss in the plains of Marignano and forced the reigning duke Maximilian Sforza to relinquish the sovereignty. On the death of Maximilian (1519) Francis was one of the com-

Francis I.

petitors for the empire; but the choice fell on Charles of Austria, the grandson of Maximilian, henceforth known as the Emperor Charles V. From this period Francis and Charles were rivals, and were almost continually at war with one another. Both attempted to gain the alliance of England. With this view Francis invited Henry VIII of England to an interview, which took place near Calais, between Guînes and Ardres, in June, 1520. The magnificence of the two monarchs and their suites on this occasion has given to the meeting the name of the Field of the Cloth of Gold. In 1521 war broke out between the rivals, which ended in Francis being defeated and taken prisoner. He could recover his liberty only by renouncing his claims to Naples, Milan, Genoa, and Asti, the suzerainty of Flanders and Artois, and promising to cede the Duchy of Burgundy and some other French fiefs. War was soon after renewed, an alliance, called the Holy League, having been formed between the Pope Clement VII, the King of France, the King of England, the Republic of Venice, the Duke of Milan, and other Italian powers, with the object of checking the advances of the emperor. In this war Rome was taken and sacked by the Constable of Bourbon (1527), and Italy was devastated, but Francis gained little either of fame or material advantage. Peace was concluded in 1529, but hostilities again broke out in 1535, when Francis possessed himself of Savoy. A hastily-made-up peace was soon broken, and Francis again found himself at war with the Emperor and the King of England. Fortunately for France the union of the Protestant princes of Germany against the emperor prevented him from following up his success, and inclined him to a peace, which was concluded at Crespy in 1544. Charles resigned all his claims on Burgundy, and allowed Francis to retain Savoy. Two years after peace was made with England. Francis I possessed a chivalric and enterprising spirit, and was a patron of learning.

Francis II, King of France, son of Henry II and Catharine of Medici, born at Fontainebleau in 1544, ascended the throne on the death of his father, 1559. The year previous he had married Mary Stuart, only child of James V, King of Scotland. The uncles of his wife, Francis, Duke of Guise, and the Cardinal of Lorraine, held the reins of government. Francis, who was of a feeble constitution, died in 1560.

Francis I, Emperor of Germany, eldest son of Leopold, Duke of Lorraine, was born in 1708. In 1736 he married Maria Theresa, daughter of the Emperor Charles VI. After the death of Charles VI (1740) he was declared by his wife co-regent of all the hereditary states of Austria, but without being permitted to take any part in the administration. After the death of Charles VII he was elected emperor in 1745. He died in 1765. See *Maria Theresa.*

Francis I, Emperor of Austria, (previously Francis II, emperor of Germany), was born in 1768; died in 1835. He was the son of the Emperor Leopold II and Maria Louisa, daughter of Charles III, King of Spain. He succeeded his father in 1792. France declared war against him in 1792, and hostilities continued till the Peace of Campo-Formio 1797. In 1799 he entered into a new coalition with England and Russia against the French republic; but in 1801 Russia and Austria were compelled to conclude the Peace of Lunéville.

France having been declared an empire in 1804, he assumed the title of *hereditary Emperor of Austria;* and on the establishment of the confederacy of the Rhine in 1806 he renounced the title of Emperor of Germany. In 1805 war again broke out between Austria and France. But after the battle of Austerlitz (1805) the Peace of Presburg was signed. In 1809 he again took up arms against France, and in the Peace of Vienna was compelled to surrender 42,000 square miles of territory. The marriage of his daughter, Maria Louisa, with Napoleon promised to form a strong tie between the imperial houses, but in 1813 he entered into an alliance with Russia and Prussia against France, and was present to the close of the contest.

Francis, OF ASSISI, ST., founder of the Franciscans, was born at Assisi, in Umbria, in 1182, where he died in 1226. In youth Francis did not refrain from the pleasures of the world; but after a serious illness he became enthusiastically devout, left the paternal roof, and in 1208 gave himself to a life of the most rigorous poverty. His followers were at first few, but when they reached the number of eleven he formed them into a new order, made a rule for them, and got it sanctioned, though at first only verbally, in 1210, by Pope Innocent III. In 1212 he received from the Benedictines a church in the vicinity of Assisi, which now became the home of the order of Franciscans or Minorites. Francis afterwards obtained a bull in confirmation of his order, from Pope Honorius III. After an unsuccessful attempt to convert the Sultan Meledin he returned to Assisi, when the order of St. Clara was founded under his direction, and a third order, called the Tertiaries, designed for penitents of both sexes. He was canonized by Pope Gregory IX in 1228. His festival is on the 4th of October. See *Franciscans.*

Francis, OF PAULA, ST., was born in 1416 in the city of Paula, in Calabria; died in France 1507. He was brought up in a Franciscan convent, and in 1436 founded a new order, which, when the statutes were confirmed by Alexander VI, received the name of the *Minims* (Latin, *minimi,* the least). To the three usual vows Francis added a fourth, that of keeping the Lenten fast during the whole year. The fame of his miraculous cures reached Louis XI of France, who invited him to France, in the hope that Francis would be able to prolong his life. After the death of Louis Charles VIII built him a monastery in the park of Plessis-les-Tours and also at Amboise, and loaded him with honor and tokens of veneration. Twelve years after his death he was canonized by Leo X, and the Catholic Church celebrates his festival April 2. See *Minims.*

Francis, JOSEPH, inventor, was born in Boston, Massachusetts, in 1801, died in 1893. At the age of eighteen he received a prize for a fast rowboat. His greatest achievements were in the construction of life-saving appliances. He made the first use of iron floating vessels. He received numerous patents, medals and decorations, and the thanks of Congress for services to his country.

Francis, PHILIP, poet and dramatist, was born in Dublin 1700, died 1773. Educated at Dublin, he took orders, and kept an academy at Esher, Surrey, where Gibbon was one of his pupils. He was latterly chaplain to Chelsea Hospital. He is best known from his translations of Horace and other classic authors.

Francis, SIR PHILIP, one of the many political writers to whom the authorship of *Junius's Letters* has been ascribed, was the son of the preceding, born in Ireland in 1740, died 1818. In 1773 he went to the East Indies, where he became a member of the council of Bengal, and the constant opponent of Warren Hastings. In 1781 Francis returned to England, and shortly after was chosen member of parliament for the borough of Yarmouth in the Isle of Wight. He took a prominent part in the impeachment of Hastings. He published several political pamphlets. See *Junius.*

Franciscans (fran-sis'kans) are the members of the religious order established by St. Francis of Assisi about 1210. They are also called Minorites, or Fratres Minores ('lesser friars'), which was the name given them by their founder in token of humility, and sometimes Gray Friars, from the color of their garment. The order was distinguished by vows of absolute poverty and a renunciation of the pleasures of the world, and was intended to serve the church by its care of the religious state of the people. The rule of the order destined them to beg and to preach. The popes granted them extensive privileges, and they had an evil repute as spies, frequenting the courts of princes and the houses of noblemen, gentry, etc. Early in the fifteenth century they split up into two branches, the Conventuals and the Observants or Sabotiers. The former went barefooted, wore a long gray cassock and cloak and hood of large

dimensions, covering the breast and back, and a knotted girdle. The Observants wore wooden sandals, a cassock, a narrow hood, a short cloak with a wooden clasp, and a brown robe. In France the members of the order not belonging to any particular sect are called Cordeliers, from the cord which they tie about them. The Capuchins, so called from the peculiar kind of hood or cowl (*capuce*) which they wear, originated in a reform introduced among the Observantists by Matthew of Baschi in the early part of the sixteenth century, and although it received the approbation of different popes within a short time after its foundation, it did not receive the right of electing a particular general and become an independent order till 1619.

Franciscan or Gray Friar (Conventual).

St. Francis himself collected nuns in 1209. St. Clara was their prioress; hence they were called the *nuns of St. Clara*. The nuns were also divided into branches, according to the severity of their rules. The Urbanists were a branch founded by Pope Urban IV; they revered St. Isabelle, daughter of Louis VIII of France, as their mother. St. Francis also founded in 1221 a third order, of both sexes, for persons who did not wish to take the monastic vows, and yet desired to adopt a few of the easier observances. They are called Tertiarians or Tertiaries, and were very numerous in the thirteenth century.

Francis Joseph I, Emperor of Austria and King of Hungary, born 1830; succeeded his uncle, Ferdinand, who abdicated in 1849. The chief events of his reign were the cession of Lombardy to Italy, as a result of the Austro-French war (1859); the loss of Venetia, as also of Austria's important influence in Germany, the result of the war with Prussia (1866); and the annexation of Bosnia and Herzegovina (1908). See Austria. He died Nov. 21.1916.

Francis-Joseph Land. See *Franz-Joseph Land.*

Francis of Sales, St. See *Sales.*

Francis Xavier, St. See *Xavier.*

Francke (fràn'kė), August Hermann, German theologian and philanthropist, born at Lübeck 1663; died at Halle 1727. He was professor of Oriental literature and then of theology at Halle, but is chiefly known for his successful labors on behalf of poor orphans. In 1695 he founded the famous orphanage at Halle, still known by his name, which now includes, besides the orphan asylum, a great variety of schools, a printing and publishing establishment, chemical laboratory, etc.

Franco-German War. The immediate occasion of this war was an offer made in June, 1870, by General Prim, then at the head of affairs in Spain, of the crown of that country to Leopold of Hohenzollern, a prince belonging to the reigning house of Prussia. The government of Napoleon III demanded of the King of Prussia that he should forbid the candidature of the prince, and when the prince voluntarily retired from his candidature, still insisted that this renunciation should be formally made by the king, and a guarantee given that the candidature would not be revived. This demand was refused, and a formal declaration of war by France against Prussia was received by Count Bismarck, the Chancellor of the North German Confederation, on the 19th of July. The French were the first in getting their troops to the frontier, but it soon became manifest that instead of being in a complete state of readiness for war, as the minister of war had declared, the French army was defective in almost everything essential to the equipment of an army.

In Germany everything formed a complete contrast to this state of affairs. Each section of the army was completely organized in the headquarters of the district which it occupied in time of peace, and was only sent to the frontiers after being furnished with everything it required. In addition to this Prussia,

against which country alone the war had been declared, was not only joined, according to treaty, by all the states of the North German Confederation, but also by those of the South, upon whose neutrality, perhaps even upon whose alliance, Napoleon and the French had counted.

Thus instead of the French army making a march of conquest through Germany, as was the expectation of the enthusiastic populace of Paris, the German army, moving with remarkable promptitude, was quickly on the soil of France and winning victories over the poorly prepared French. It was divided into three sections, respectively under the command of General Steinmetz, Prince Frederick Charles, and the Crown Prince of Prussia, King William, aided by the famous strategist Von Moltke and a staff of general officers, being in general command. Victories won at Weissenburg on August 4 and at Wörth and Forbach on the 6th, put the whole French line in retreat. Bazaine with the northern army was overtaken and defeated at Courcelles on the 14th and again at Marsles-Tour and Gravelotte, after which he took refuge behind the fortifications of Metz, where he was besieged by the army under Prince Frederick Charles. Meanwhile the Crown Prince had advanced as far as Nancy, where he awaited reinforcements before engaging MacMahon, who had reached Châlons with a strong army. The advanced detachments of the two armies met on August 27, and a series of engagements and strategic movements ensued, to the advantage of the Germans, the result being that on the 1st of September MacMahon, with whom was the French emperor, was surrounded at Sedan by a force of overwhelming strength. The position of the army was hopeless and on the following day the troops and fortress were surrendered, 50 generals, 5000 other officers and 84,000 soldiers becoming prisoners of war,—among them Napoleon III. The only army now left to France was that of Bazaine, then closely besieged at Metz and this, unable to escape, capitulated on the 20th of October.

The first result of the surrender at Sedan was an outburst of rage of the Parisians against the Napoleonic dynasty, a republic being proclaimed on September 4 and a government of national defense formed, with General Trochu at its head. By September 19 the German army reached and invested Paris, in such force that the utmost efforts of the French could not relieve their capital city. It held out longer than could have been expected under the circumstances, but the repulse of the last sally, on January 19, showed that a capitulation was inevitable, and on the 21st of February M. Thiers, executive of the new republic, arrived at Versailles with a diplomatic commission. Preliminaries of peace were signed on February 26 and accepted by the assembly at Bordeaux on March 1. The principal terms were the following: 1. That France should cede to Germany one-fifth part of Lorraine, including Metz, together with the whole of Alsace except Belfort and the surrounding district. 2. That France should pay to Germany a war indemnity of five milliards of francs ($1,000,000,000). 3. That certain departments of France should remain in the occupation of the Germans, and should not be fully evacuated until after the payment of the whole indemnity. The definitive treaty of peace, which was signed at Frankfort on the 10th of May, and ratified on the 21st, confirmed in all essential particulars the preliminaries of Versailles. The last installment of the war indemnity was paid on the 5th of September, 1873, and France was completely evacuated by the Germans on the 13th of the same month.

François (frân-swä), St., a town in the French West Indies, in the island of Guadeloupe. Pop. about 6000.

Francolin (fran'ko-lin), a genus of birds belonging to the same family with the partridge, which they resemble in many respects, though they usually have one or more strong and sharp horny spurs on the tarsi. The only European member of the genus is the *Francolinus vulgāris*, which is characterized by a red band round the neck, and red feet. It is found in the south of France, Sicily, Cyprus, and the southern part of Europe generally. The other species are found in Africa, Asia, and Oceanica.

Franconia (fran-kō'ni-a; in German, *Franken*, so called because early in the sixth century it was colonized by Franks), a district of Germany lying to the east of the Rhine, and traversed by the Main. After the dismemberment of the Carlovingian Empire this district became attached to the German division, and ultimately formed one of the grand-duchies of Germany. In 1806 it was partitioned among Würtemberg, Baden, Hesse-Cassel, the Saxon duchies, and Bavaria. The last received the largest share, now forming the three divisions of Upper, Middle, and Lower Franconia.

Franconian Wines, German wines produced chief-

ly in the Bavarian district of Lower Franconia. The chief sorts are known as *Leistenwein* and *Steinwein*.

Franc-tireur (frâṇ-tē-reur), lit. a free shooter: an irregular sharpshooter, one of a body of soldiers organized in France in the war of 1870, and employed in guerrilla warfare for harassing the enemy, cutting off detachments, etc.

Franeker (frän'ek-ėr), a town in Holland, in the province of Friesland, on a canal communicating with the sea at Harlingen. It was long celebrated as the seat of a school of theology. Pop. 7187.

Frangipani (fran-ji-pä'nē), a perfume invented by the Marquis Frangipani, Maréchal des Armées of Louis XIII of France. It was a powder composed of every spice then known, with the addition of ground orris-root and musk. It is now a perfume prepared from, or imitating the odor of, the flower of a West Indian tree, *Plumiera rubra*, or red jasmine.

Frangulin (fran'gu-lin; $C_8H_8O_3$), a yellow, crystallizable coloring matter contained in the bark of the berry-bearing alder (*Rhamnus Frangula*. It is a bright-yellow, silky, crystalline mass, without taste or smell, which fuses on heating, and can be sublimed in golden needles. It dyes silk, wool, and cotton.

Frank, the signature of a person possessing the privilege of sending letters free of postage. This privilege was formerly enjoyed by members of congress and the highest officials of the Government, but it was greatly abused and by act of Congress, taking effect July 1, 1873, the privilege was entirely abolished. Envelopes with a notice of the penalty incurred by using them except for official purposes are now exclusively used. The use of these for public documents was restored to members of Congress in 1875 and to other officials of the government at later dates, there being a penalty for the use of the official envelope for private matter.

Frankalmoigne (-moin), literally 'free alms,' an English mode of tenure according to which a religious corporation held lands without being required to perform any but religious services, such as praying for the souls of the donors. This is the tenure by which almost all the ancient monasteries and religious houses held their lands, and by which the parochial clergy and very many ecclesiastical and eleemosynary foundations hold them to this day, the nature of the service being upon the Reformation, altered and made conformable to the reformed church.

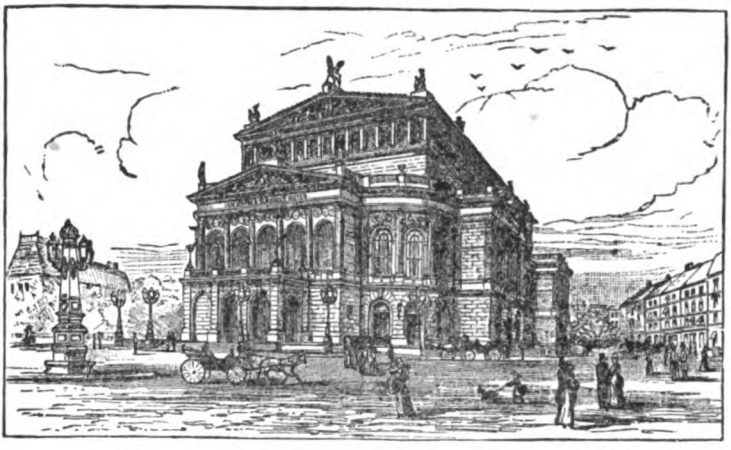
Frankenberg (frank'en-burg), a German town, kingdom of Saxony, 40 miles S. E. of Leipzig. It is regularly built, and has extensive manufactures of woolens, cottons, and silks, etc. Pop. 12,726.

Frankfort (frank'fort), a city, county seat of Clinton Co. Indiana, 24 miles E. S. E. of Lafayette, in an agricultural section. It has large machine shops, railroad shops and manufactories of furniture, brickmaking machines, etc. Pop. 8634.

Frankfort, a city, capital of Kentucky and of Franklin Co., is situated on both banks of Kentucky River, 65 miles E. of Louisville. The public buildings, comprising the State-house, State penitentiary, and various institutions, are handsome, and the scenery around the city is notable for picturesque beauty. It has sawmills and various manufactures, and a large lumbering trade. Pop. 10,465.

Frankfort-on-the-Main (German, *Frankfurt am Main*), a town of Prussia, in the province of Hessen-Nassau, 20 miles N. E. of Mayence (Mainz). It was formerly a free town of the empire, and down to 1866 one of the free towns of the German Confederation and the seat of the diet. It is mainly situated on the right bank of the Main, but has the suburb of Sachsenhausen on the left bank, the river being crossed by seven bridges. The north or right bank of the river is lined by a spacious quay. The older part of the town contains a number of ancient houses, and largely consists of narrow and unattractive streets, but the principal street, the Zeil, and those of the newer parts of the town, are spacious and have many handsome modern buildings. The older portion is surrounded by the Anlagen or promenade with gardens, on the site of the old fortifications. Fronting this promenade and in the districts outside of it are many very handsome, and some palatial, private residences with gardens. The Römerberg and the Ross-markt (horse-market) are the chief squares in the town. The Römer or town-house was erected about 1405, but not completed in its present form till 1740. In one of its halls, the Wahlzimmer, the electors of the empire met and made their arrangements for the election of the emperor, and the Senate of Frankfort held its sittings. In another, the Kaisersaal, the emperor was banqueted after his election, and waited on at table by kings and princes. The

most remarkable of the churches is the Dom or Cathedral of St. Bartholomew (R. Catholic), in which the German emperors after 1711 were crowned. It is a Gothic edifice, begun in 1238. The choir was built in 1315-18. The building was seriously injured by fire in 1867, but has been completely restored, the tower left incomplete since 1514 being finished in accordance with the original plans. Other buildings are the new opera-house, one of the finest buildings of the kind; the courts of justice, of modern construction; the new exchange, a spacious and handsome edifice; the large palace of the Prince of Thurn and Taxis; the new railway-station, a very elegant edifice, which will favorably compare with any similar structure; the archive-building, postoffice, the house in which Luther dwelt, and that in which Goethe was born. There are monuments to Gutenberg, Goethe, Schiller, and others. Frankfort is rich in collections connected with literature and art, and in establishments intended to promote them. The chief of these are the Historical Museum (in the archive-building), the Städel Art Institute (in Sachsenhausen, containing a fine gallery of pictures and other collections; the Senckenberg Museum of Natural History; the town library, possessing over 150,000 printed volumes. There is also a zoological garden and the Palm Garden, both favorite places of resort. The manufactures comprise chemicals, ornamental articles of metal, sewing machines, straw hats, soap, perfumery, beer, etc. A great business is done in money and banking. The town is provided with tramways, is a great railway center, and is now reached by the largest vessels navigating the Rhine. Frankfort dates from the time of Charlemagne. It was made an imperial free city by a decree of the Emperor Louis V in 1329. Frederick Barbarossa had been elected emperor here in 1152, and in 1356 the right of being the place of election for all future emperors was granted to it by the Golden Bull. Frankfort suffered severely in the Schmalkald war (1552), the Thirty Years' war (1635), the Seven Years' war (1762), and during the French wars (1792, 1796, 1799, 1800, 1806). Under Napoleon it became the capital, first of a principality, and then, in 1806, of a grand-duchy. From 1814 to 1866 it was one of the four free cities of the German Confederation, and in 1866 it was taken by the Prussians. Population (1910) 414,376.



The new Opera-house, Frankfort.

Frankfort-on-the-Oder (*Frank'furt an der Oder*), a town of Prussia, province of Brandenburg, on the Oder, 52 miles E. S. E. Berlin. It is built with considerable regularity, and is an important military center. Many retired officers and government officials take up their residence here. The manufactures consist of machinery and metal goods, chemicals, leather, earthenware, spirits, etc.; and the trade is extensive both by land and water. Frankfort was annexed to Brandenburg in 1250, and notwithstanding its repeated captures during the Hussite, the Thirty Years', and the Seven

Years' wars, was always an important commercial place. Pop. (1910) 68,235.

Frankincense (frangk'in-sens), a name given to the oleoresinous exudations from different species of conifers. American frankincense is got as a soft, yellow, resinous solid, with a characteristic turpentine odor, from *Pinus Taeda*. Another kind is exuded by the spruce fir, and forms a soft solid, the color of which varies from white to violet red. From this Burgundy pitch is prepared by melting in water and straining through a cloth. The frankincense employed in religious ceremonies (called also *incense* and *olibănum*) is a gum-resin obtained from *Boswellia thurifĕra* (or *serrăta*), a tree somewhat resembling the sumach, belonging to the Amyridaceæ, and inhabiting the mountains of India. It comes to us in semi-transparent, yellowish tears, or sometimes in masses, of specific gravity 1.22, and possesses a bitter and nauseous taste.

Franklin (frank'lin), a village of Franklin town (township), Norfolk Co., Massachusetts, 27 miles s. w. of Boston. It is the site of Dean Academy, and has extensive manufactures of woolen goods, also pianos, straw, and cotton goods. Pop. 5641.

Franklin, a city of Merrimac Co., New Hampshire, on the Merrimac River, 19 miles N. N. W. of Concord. Its manufactures include needles, knitting machines, flannel, paper, hosiery, etc. Known as Salisbury, it was the birthplace of Daniel Webster. Pop. 6132.

Franklin, a city, capital of Venango Co., Pennsylvania, on the Allegheny River at the mouth of French Creek, 9 miles s. w. of Oil City, it being the center of the chief oil region of the State. Natural gas is also abundant. It has oil refineries and manufactures of iron and steel, oil-well supplies, bricks and lumber. Pop. 9767.

Franklin, BENJAMIN, an American writer and statesman, born at Boston in 1706; died at Philadelphia in 1790. He was placed with his brother, a printer, to serve an apprenticeship to that trade, and his brother having started the *New England Courant*, Franklin secretly wrote some pieces for it, and had the satisfaction to find them well received. But, on this coming to the knowledge of his brother, he was severely lectured for his presumption, and treated with great harshness. Soon after he quitted his brother's employment, and at the age of seventeen started for Philadelphia, where he obtained employment as a compositor. Here he attracted the notice of Sir William Keith, the Governor of Pennsylvania, who induced him to go to England for the purpose of purchasing types to establish himself in business, and when there left him to shift for himself. He got work in a printing office, and after a residence of eighteen months in London came back to Philadelphia. Here he returned to his trade, and in a short time formed an establishment of his own, in connection with a person who supplied the necessary capital. They printed a newspaper, which was managed with much ability, and gave Franklin much reputation. By his exer-

tions a public library, improved systems of education, a scheme of insurance, etc., were established in Philadelphia. In 1732 he published his *Poor Richard's Almanack*, which continued to be issued till 1757. Being in Boston in 1746 he saw, for the first time, some experiments in electricity, which led him to begin those investigations which resulted in the identification of lightning and electricity, and the invention of the lightning-conductor. As a member of the provincial assembly of Pennsylvania he displayed much ability in political affairs, and in 1757 was sent to England as an agent of the province. His reputation was now such, both at home and abroad, that he was appointed agent of the provinces of Massachusetts, Maryland, and Georgia. Oxford and Edinburgh conferred on him their highest academical degrees for his electrical researches, and the Royal Society elected him a fellow. In 1762 he returned to America: but was again appointed agent in 1764, and brought to England a remonstrance against the project of taxing the colonies. He opposed the stamp-act, and in 1774 presented to the king the petition of the first American Congress. On his return he was

elected a member of the Congress, and exerted all his influence in favor of the Declaration of Independence. In 1776 he was sent to France as commissioner plenipotentiary, to obtain supplies from that court. After the surrender of Burgoyne he concluded with France the first treaty of the new states with a foreign power (1778), and was subsequently named one of the commissioners for negotiating the peace with the mother country. On his return to his native country he filled the office of president of Pennsylvania, and served as a delegate in the Constitutional Convention of 1787, and approved the Constitution then formed. His works include his unfinished *Autobiography*, and a great number of political, antislavery, financial, economic, and scientific papers. With Washington, he ranks as one of the two greatest and ablest men the United States has yet produced.

Franklin, Sir John, an English Arctic voyager, born in Lincolnshire in 1786; died near Lancaster Sound, in 1847. He entered the navy as a midshipman at the age of fourteen, and was present at the battle of Copenhagen in 1801. He afterwards accompanied Captain Flinders on his voyage to the coast of Australia (1801-03). Shortly after his return he was appointed to the *Bellerophon*, and had charge of her signals during the battle of Trafalgar. Two years later he joined the *Bedford*, which was employed successively in the blockade of Flushing, on the coast of Portugal, and on the coast of America. On the last station he took part in the attack on New Orleans in 1814 and was slightly wounded. His Arctic work began in 1819, when he conducted an overland expedition for the exploration of the north coast of America from Hudson Bay to the mouth of Coppermine River. On his return to England he published a narrative of the expedition, was promoted to the rank of captain, and elected a F. R. S. In a second expedition he surveyed the coast from the mouth of the Coppermine west to Point Beechy, thus traversing in his two expeditions about a third of the distance between the Atlantic and the Pacific. On his return in 1827 he received the honor of knighthood. After serving for some years in the Mediterranean he held the post of governor of Tasmania from 1836 to 1843. In 1845 he took command of the *Erebus* and *Terror* in what proved his last polar expedition. The problem was the discovery of an Arctic waterway between the Atlantic and the Pacific. The expedition was seen in Melville Bay two months later, but from that time no direct tidings were received from it. Many expeditions were sent in search of him both from Britain and America, but with little success. At last an expedition, sent out under McClintock in 1857, discovered in 1859, at Point Victory, in King William's Land, a document which had been deposited in a cairn thirteen years before, and gave the latest details of the ill-fated expedition. This paper stated that Sir John died 11th June, 1847; that the ships were abandoned in April, 1848; and that the crews, 105 in number, had started for the Great Fish River. None survived, but many relics of the party have been recovered by later expeditions.

Franklin, William Buells, soldier, born at York, Pennsylvania, in 1823; died in 1903. He graduated at West Point Academy in 1843, served under General Taylor in the Mexican War as a topographical engineer, and became a brigadier-general of volunteers at the outbreak of the Civil War. He was in the battle of Bull Run and the Peninsular campaign and was promoted major-general in 1862. He served during the rest of the war, was breveted major-general in the regular army in 1865, but soon resigned to engage in business. He was U. S. Commissioner General to the Paris Exposition of 1889.

Franklinite (frank'lin-it), a mineral composed of oxide of iron 64.5 to 66, oxide of zinc 21.8, and oxide of manganese 12.23 to 13.5, and is therefore considered as belonging to the group of minerals called *spinels*. It is found in New Jersey and named after Dr. Franklin.

Frank-pledge, literally pledge or surety for a freeman. Frank-pledge was a law prevailing in England before the Norman conquest, by which the members of each decennary or tithing, composed of ten households, were made responsible for each other, so that if one of them committed an offense the others were bound to make reparation.

Franks, a Germanic tribe or aggregate of tribes which overthrew the Visigoths and Burgundians in Gaul, and gave origin to the name France. See *France*.

Franzensbad (frânts'ens-bât), a watering-place in Bohemia, about 3 miles north of Eger. The mineral springs are alkaline, saline, and chalybeate, and are very efficacious, particularly in scrofulous and cutaneous affections. Pop. 2330.

Franz-Joseph Land, an island group in the Arctic Ocean, lying north of Nova Zem-

bla, and consisting of two chief islands, much broken up by fiords, and a number of smaller ones.

Franzos (frânt'sōs), KARL EMIL, novelist, born at Podolia, Austria, in 1848, of Jewish parentage. His first literary work, *Simé Asia: Pictures of Life in Galicia, Bukowina, Southern Russia and Rumania*, was a brilliant success and was widely translated. It was followed by many novels and romances, including *Mein Franz, Der Präsident, Tragische Novellen*, etc.

Frascati (fras-kä'tē), a town of Italy, about 10 miles S. E. of Rome, situated on the slopes of the Alban Hills, near the site of the ancient Tusculum. It is much resorted to by the Romans in the summer season. Charles Edward Stuart, the Young Pretender, is buried here, in the Cathedral of S. Pietro. Pop. 9915.

Fraser (frā'zer), ALEXANDER CAMPBELL, a Scottish philosophical and miscellaneous writer, born in 1819. He succeeded Sir William Hamilton in the professorship of logic and metaphysics in the University of Edinburgh, 1856. From 1850 to 1857 he edited the *North British Review*, and published *Essays in Philosophy*, 1856; *Rational Philosophy*, 1858; and a collected edition of the works of Bishop Berkeley.

Fraser, SIMON. See *Lovat.*

Frasera (frā'sėr-a), a genus of plants, nat. order Gentianaceæ, containing seven species of erect perennial herbs, natives of North America. *F. Carolinensis* is indigenous in the swamps of the Carolinas. The root yields a powerful bitter, wholly destitute of aroma. In its medicinal effects it is equal to gentian, and when fresh is said to be emetic and cathartic.

Fraserburgh (frā'sėr-burg), a seaport of Scotland, in Aberdeenshire, 22 miles east of Banff. It is substantially built, and has a townhall, a market-cross, building-yards, and two harbors. Fraserburgh is the chief seat of the Scotch herring-fishery. Pop. 9715.

Fraser River, the principal river in British Columbia, rising in the Rocky Mountains. It first flows northwest for about 270 miles, then turns south, and after a total course of about 500 miles falls into the Gulf of Georgia. Gold is found on both the Fraser and its affluents, and the salmon fisheries are important. Its principal affluents are the Thomson, Quesnelle, and Stuart rivers. New Westminster, Hope, Yale, and Lytton are on its banks.

Fraserville (frā'zėr-vil), a town in Quebec, Canada, on the St. Lawrence. Pop. (1911) 6774.

Fratercula (fra-tėr'ku-la), a genus of web-footed birds, containing the puffins (which see).

Fraternal Societies, organizations devoted to social intercourse and to mutual benefit. They are numerous in modern nations, many of those of England having made their way to the United States, while others have originated in this country. Their obligations usually include the payment of sick and death benefits and fraternal care of sick members. In some of them the lodge principle prevails and social features are prominent. Among them are the Odd Fellows, Free Masons, Knights of Pythias, Order of Red Men, Artisans, etc.

Fraternities (fra-tėr'na-tēs), a voluntary association of men for promoting their common interest, business or pleasure. In this wide sense it includes all secret and benevolent societies, the monastic and sacerdotal congregations, the orders of knighthood, and also guilds, trades-unions, and the like. In a limited sense it is applied to religious societies for pious practices and benevolent objects. Fraternities were often formed during the middle ages, from a desire of imitating the holy orders. Many of these societies, which did not obtain or did not seek the acknowledgment of the church, had the appearance of separatists, which subjected them to the charge of heresy. The pious fraternities which were formed under the direction of the church, or were acknowledged by it, were either required by their rules to afford assistance to travelers, to the unfortunate, the distressed, the sick, and the deserted, on account of the inefficiency of the police, and the want of institutions for the poor, or to perform certain acts of penitence and devotion. Of this description were the Fratres Pontifices, a brotherhood that originated in Tuscany in the twelfth century, where they maintained establishments on the banks of the Arno, to enable travelers to cross the river, and to succor them in case of distress. A similar society was afterwards formed in France, where they built bridges and hospitals, and provided for the security of the highways. Similar to these were the Knights and Companions of the Santa Hermandad (or Holy Brotherhood) in Spain; the Familiars and Crossbearers in the service of the Spanish Inquisition; the Calendar Brothers in Germany; the Alexians in Germany, Poland, and the

Netherlands, etc. The professed object of the Alexians, so called from Alexius, their patron saint, was to visit the sick and imprisoned; to collect alms for distribution; to console criminals, and accompany them to the place of execution; to bury the dead, and to cause masses to be said for those who had been executed or for persons found dead. There were also Gray Penitents (an old fraternity of an order existing as early as 1264 in Rome, and introduced into France under Henry III), the black fraternities of Mercy and of Death; the Red, the Blue, the Green, and the Violet Penitents, so called from the color of their cowl; the divisions of each were known by the colors of the girdle or mantle. The fraternity of the Holy Trinity was founded at Rome in 1548 by Philip de' Neri for the relief of pilgrims and the cured dismissed from the hospitals. The Brothers and Sisters of Charity are another fraternity whose hospitals are found in all the principal cities of Catholic Christendom.

Fraticelli (frâ-ti-chel'lē; the diminutive plural of Italian, *frate*, brother or monk), the name given about the end of the thirteenth and during the fourteenth century, and even later, to wandering mendicants of different kinds, but especially to certain Franciscans, who pretended to practise the rules of their order in their full rigor. They claimed to be the only true church, and denounced the pope, whose authority they threw off, as an apostate. They made all perfection consist in poverty, forbade oaths, and discountenanced marriage, and were accused by their opponents of very lewd practices. The sect is said to have continued till the Reformation which its members embraced.

Frattamaggiore (frât-tâ-mâ-jō'rā), a town of Italy, 6 miles N. E. of Naples. Manufactures ropes and silk. Pop. 13,170.

Fraud (frąd), an act or course of deception deliberately practised with the view of gaining an unlawful or unfair advantage, such as the obtaining of goods under false pretenses, and the like. All frauds or attempts to defraud, which cannot be guarded against by common prudence, are indictable at common law, and punishable arbitrarily according to the heinousness of the offense. Every species of fraud which the law takes cognizance of renders voidable every transaction into which it enters as a constituent material element. Fraud may be by false representation, concealment of material circumstances that ought to be revealed, underhand dealing, and by taking advantage of imbecility or intoxication. A constructive fraud in law is such fraud as is involved in an act or contract which, though not originating in any actual evil or fraudulent design, yet has a tendency to deceive or mislead other persons, or to violate public or private confidence, or to impair or injure the public interests. Gross criminal frauds are punishable by way of indictment or information; such as playing with false dice, causing an illiterate person to execute a deed to his prejudice, etc. Frauds are not indictable at common law unless they be such as affect the public, as using false weights and measures.

Fraunhofer (froun'hō-fĕr), Joseph von, a German optician, born in 1787, died in 1826. He ultimately became a partner in a manufactory of optical instruments at Munich. His many improvements in glassmaking, in optical instruments, and in the polishing of lenses have been eclipsed by his investigation of the innumerable dark fixed lines in the solar spectrum, known as *Fraunhofer's lines*. The importance of this discovery can scarcely be overestimated. It led to the invention and use of the spectroscope, to the science of spectroscopy, and to all our present knowledge of solar and stellar chemistry. See *Spectroscope*, *Spectrum*, etc.

Fraustadt (frou'stât), a town of Prussia, in the government of Posen. 15 miles northeast of Glogau. Pop. 7462.

Fraxinella (frak-si-nel'a), a species of dittany, the *Dictamnus Fraxinella*, an ornamental herbaceous annual plant, cultivated for its fragrant leaves and handsome rose-colored flowers.—*Dictamnus albus*, or common dittany, is also called fraxinella; its flowers are white.

Fraxinus (frak'sin-us), a genus of deciduous trees of the order Oleaceæ, containing the ash.

Fray Bentos (frī ben'tos) a small town of Uruguay, on the river Uruguay, about 170 miles northwest of Montevideo. It owes its existence to immense slaughter-houses and other establishments connected with the extract-of-meat trade. Pop. about 5000.

Frechette (frĕ-shet'), Louis Honoré, a French Canadian author, born at Levis, Quebec, in 1839. He was educated at Nicolet College and Laval University, studied law and was called to the bar of Lower Canada, represented his native country in the Dominion parliament (1874-79), contributed to various newspapers, and became editor of *La Patrie* in Montreal in 1884. He pub-

lished collections of poems entitled *Mes Loisirs, Les Fleurs Boréales* and *Les Oiseaux de Neige* (the two last crowned by the French Academy); the dramas *Félix Poutré* (1862), *Papineau* (1880), *The Thunderbolt* (1882), etc. In prose he wrote *Petite Histoire des Rois de France, Lettres à Basile*, etc.

Freckles (frek'lz) are small yellow or brownish-yellow spots of a circular form, situated in the middle layer of the skin and underneath the cuticle. They only appear to any appreciable extent on those surfaces exposed to the action of the sun, as the neck, face, hands, and arms. This affection is most common in persons of fair complexion and hair; in some cases it is permanent, but in most it disappears with the warm season.

Fredegonde (f r e d - a - gun'da), the w i f e of Chilperic, a Frankish king of Neustria, born 543; died 597. While in the service of the first and second wives of Chilperic her beauty captivated the king. In order to arrive at the throne Fredegonde got Andowena, the first wife of the king, removed by artifice, and the second (Galswintha) by assassination (568). This led to a war between Chilperic and his brother Sigebert, king of Austrasia, Brunehilde, wife of Sigebert and sister of the murdered queen, urging her husband to vengeance. Fredegonde found means to have Sigebert assassinated, captured Brunehilde and her daughters, and after a series of crimes, ending with the assassination of her husband, she seized the reins of government on behalf of her son Clothaire, and retained possession of them until her death.

Fredericia (fred-er-rish'i-a), a seaport and fortress of Denmark, in Jutland, at the north entrance of the Little Belt. In 1849 the army of Schleswig-Holstein was defeated here by the Danes, and in 1864 the Danes were compelled to evacuate it before the superior Austro-Prussian forces. Pop. 12,714.

Frederick (fred'er-ik), a city, capital of Frederick Co., Maryland, 61 miles w. of Baltimore. It has an extensive trade, chiefly in live stock, grain, flour, tobacco, wool, etc., and various manufactures. During the Civil War it was occupied on different occasions by the opposing armies. It is the scene of the exploit made famous by the poem of *Barbara Fritchie*. Pop. 10,411.

Frederick I, Barbarossa (or, as the Germans call him, Rothbart, both surnames meaning 'Redbeard'), German emperor, son of Frederick, duke of Suabia, was born 1121, and received the imperial crown in 1152 on the death of his uncle the Emperor Conrad III. His principal efforts were directed to the extension and confirmation of his power in Italy. In his first expedition to Italy in 1154 he subdued the towns of Northern Italy, and then got himself crowned at Pavia with the iron crown of Lombardy (April, 1155), and afterwards at Rome by Pope Adrian IV with the imperial crown (June, 1155). Soon after his return to Germany the Lombard cities revolted, and Frederick led a second expedition into Italy (1158), took Brescia and Milan, and at the diet of Roncaglia, at which all the cities and imperial vassals of Italy were represented, he assumed the sovereignty of the towns and received the homage of the lords. The rights assigned to the empire were so great that many of the cities refused to acknowledge them, and Milan especially prepared for resistance. Meantime Pope Adrian IV died (1159), and in electing a successor the cardinals were divided, one section choosing Victor IV and another Alexander III. Frederick supported Victor, and Alexander was compelled to flee from Italy and take refuge in France. Other expeditions into Italy were made in 1161 and 1166, in the latter of which Frederick at first carried everything before him, and was even able to set up in Rome the Antipope Paschalis III, whom he supported after the death of Victor IV. His successes were put an end to, however, by a terrible pestilence, which carried off a large part of his army, and compelled him hastily to return to Germany. Scarçely had he settled the most pressing difficulties here when he undertook, in 1174, a fifth expedition into Italy; but he was totally defeated in the battle of Legnano on the 29th of May, 1176, in consequence of which nearly all that he had won in Italy was again lost, and he was compelled to acknowledge Alexander III as the true pope. In 1188 he assumed the cross, and with an army of 150,000 men and several thousand volunteers set out for Palestine. After leading his army with success into Syria he was drowned in crossing the river Kalykadnus in 1190.

Frederick II, Hohenstaufen, grandson of the preceding, born 1194, was son of the Emperor Henry VI and of the Norman Princess Constance, heiress of the Two Sicilies. He remained under the guardianship of Innocent III till 1209, when he took upon himself the government of Lower Italy and Sicily. The imperial

crown of Germany was then worn by a rival, Otho IV, whose defeat at the battle of Bouvines opened the way to Frederick, who in 1215, after pledging himself to undertake a crusade, was crowned at Aix-la-Chapelle. He caused his eldest son Henry to be chosen king of Rome in 1220, and the same year received the imperial crown from the pope. His ambition aimed at the subjugation of Lombardy, the mastership of all Italy, and the reduction of the popes to their old spiritual office as the leading bishops in Christendom. This led him into constant struggles in Germany and Italy. In 1227 he undertook a crusade; but when he did reach the Holy Land he was able to effect nothing permanent, although he had crowned himself at Jerusalem as king of Judea. On his return he had to suppress a revolt of his son Henry, whom he imprisoned for life. In 1237 he broke the power of the Lombard League by a victory at Corte Nuova in Lombardy, and marched on Rome, but did not attack it. The remainder of his life was occupied with his troubles in Italy, and he died in the midst of his wars in 1250. He was one of the ablest and most accomplished of the long line of German emperors, and art, literature, commerce, and agriculture received every encouragement at his hands. He himself was a good linguist, was acquainted with natural history, was a minnesinger, and a writer on philosophy.

Frederick I, King of Prussia, son of the Great Elector, born 1657; died 1713. He succeeded his father as Elector of Brandenburg in 1688; became King of Prussia in 1700; and was all his reign bitterly opposed to France.

Frederick II, King of Prussia, known as Frederick the Great, born Jan. 24, 1712; died Aug. 17, 1786. He was the son of Frederick William I and the Princess Sophia Dorothea, sister of George II of England. Although he was instructed only in the details of military exercises and service, his taste for poetry and music was early developed. He was brutally treated by his father, and in 1733 he was obliged to marry the Princess Elizabeth Christina, daughter of Ferdinand Albert, duke of Brunswick-Bevern. Frederick William gave the castle of Schönhausen to her, and to the prince the county of Ruppin, and in 1734 the town of Rheinsberg, where he lived, devoting himself chiefly to literary pursuits, composing several works, and corresponding with foreign scholars, particularly with Voltaire, whom he greatly admired. The death of his father raised him to the throne in 1740, and it was not long before he asserted the claims of the house of Brandenburg to a part of Silesia then held by Maria Theresa. But his proposals being rejected, he occupied Lower Silesia in December, 1740, defeated the Austrians near Mollwitz, and at Czaslau (Chotusitz), and the First Silesian war was terminated by the peace signed at Berlin, July 28, 1742, leaving Frederick in possession of Silesia. Soon the Second Silesian war broke out, the result of which was equally favorable for Frederick. By the Peace of Dresden (December 15, 1745) he retained Silesia and acknowledged the husband of Maria Theresa, Francis I, as emperor. During the eleven following years of peace Frederick devoted himself to the domestic administration, to the improvement of the army, and at the same time to the muses. He encouraged agriculture, the arts, manufactures, and commerce, reformed the laws, increased the revenues of the state, and perfected the organization of his army, which was increased to 160,000 men. Secret information of an alliance between Austria, Russia, and Saxony gave him reason to fear an attack and the loss of Silesia. He hastened to anticipate his enemies by the invasion of Saxony (1756), with which the Seven Years' war, or Third Silesian war, commenced. This was a far more severe struggle than either of the former. In it Frederick had against him Austria, Russia, France, Sweden, and greater part of Germany, though Britain and some of the German states were on his side. He gained victories at Prague, Rossbach, Leuthen, Zorndorf, Toggau, and Freiberg, but suffered severe defeats in the battles of Kollin, Hochkirch and Kunersdorf. (See *Seven Years' War.*) The Peace of Hubertsburg (1763)) terminated this war, Frederick keeping Silesia and ceding nothing. Frederick came out of the Seven Years' war with a reputation which promised him, in the future, a decisive influence in the affairs of Germany and Europe. His next care was the relief of his kingdom, drained and exhausted by the contest. This he prosecuted with great diligence and liberality. On the partition of Poland in 1772 Frederick received a large accession to his dominions. In 1778-79 he frustrated the designs of the Emperor Joseph II on Bavaria, and the war of the Bavarian Succession was terminated without a battle by the Peace of Teschen (May 13, 1779). Austria consented to the union of the principalities of Franconia with Prussia, and renounced the feudal claims of Bohemia to those coun-

tries. In the evening of his active life Frederick concluded, in connection with Saxony and Hanover, the conference of the German princes, July 23, 1785. An incurable dropsy hastened the death of Frederick, who left his nephew, Frederick William II, a kingdom increased by 29,000 square miles, a well-filled treasury, an army of 200,000 men, great credit with all the European powers, and a state distinguished for population, industry, wealth, and science. Frederick's works, relating chiefly to history, politics, military science, philosophy, and the belles-lettres, were all written in French, the language which he regularly used, as he despised German. He was a man of the highest abilities, but in some respects narrow and repellant. Among his closest friends was the Scottish exile, Marshal Keith. Carlyle's *Life of Frederick the Great* is an able presentation of his career.

Frederick III, Emperor of Germany, born in 1831; succeeded William I March 9, 1888; died June 15, 1888. In 1858 he married the Princess-Royal of Britain, eldest daughter of Queen Victoria. He commanded the Army of the Oder in the war with Austria (1866), and in the Franco-German war he led the army which ultimately forced Napoleon III and his army to surrender at Sedan. He also took a prominent part in the siege of Paris. In 1887 he was attacked by a serious throat affection, which turned out to be of a cancerous character, and which after a series of relapses proved fatal. His renown as a military commander, his liberal views, his patience and fortitude under trouble, and his many lovable qualities made him popular.

Frederick VIII, King of Denmark, succeeded Christian IX in 1906. He was born in 1843, married the Princess Louisa of Sweden in 1869, and had three daughters and four sons, the oldest son, now Christian X, born in 1870. He was brother to the dowager Queen Alexandra of Britain, the dowager Empress Dagmar of Russia, and George I of Greece, and father of Haakon VII of Norway. Died in 1912.

Frederick Augustus II and III.

See *Augustus.*

Frederick Charles, Prince, known as the 'Red Prince,' born 1828; died 1885. He was nephew to the Emperor William I, and gained fame for his military exploits during the wars of 1866 and 1870. Sadowa, Thionville, Gravelotte, and St. Privat are among his chief achievements.

Fredericksburg, a city of Virginia, on the Rappahannock, 60 miles north by east of Richmond. Here the Federal forces under Burnside were defeated by the Confederates under Lee on the 13th of December, 1862. It has varied manufacturing industries, and the river affords considerable water-power. The city is under commission form of government. Pop. 5874.

Frederickstad, a town of Norway, at the mouth of the Glommen, 48 miles S. E. of Christiania. Formerly strongly fortified, it has an arsenal, manufactures hardware, pottery, etc., and has some shipping and general trade. Pop. 14,553.

Frederick William, of Prussia, generally called the *Great Elector*, was born in 1620; died in 1688. At the age of twenty he succeeded his father as Elector of Brandenburg. He must be considered as the founder of the Prussian greatness, and as the creator of a military spirit among his subjects. His reign began when the unhappy Thirty Years' war was still raging in Germany, and his conduct towards both parties was prudent. He succeeded in freeing Prussia from feudal subjection to Poland; and obtained possession of Pomerania in 1648. In 1672 he concluded a treaty with the Dutch Republic, when this state was threatened by Louis XIV. In 1673 he concluded a treaty by which France promised to evacuate Westphalia, and to pay 800,000 livres to the elector, who, in return, broke off his treaty with Holland, and promised not to render any aid to the enemies of France. In 1674 the German Empire declared war against France. The elector marched 16,000 men into Alsace, but a Swedish army having been induced to invade Prussia, Frederick turned back and totally defeated it at Fehrbellin (1675). Some years after the Swedes again invaded his territories, but were driven back. France, however, demanded the restoration of all the conquered territories to Sweden. The elector, having refused compliance, formed an alliance with Denmark, and waged a new war against Sweden, but was at last obliged to submit. He paid great attention to the promotion of agriculture and horticulture, and, by affording protection to the French refugees, gained 20,000 industrious manufacturers, who were of the greatest advantage to the north of Germany. Berlin was much improved during his reign. He left to his son a country much enlarged and improved, an army of 28,000 men, and a well-supplied treasury.

Frederick William I, King of Prussia, son of Frederick I and father of Frederick the Great (II), was born in 1688; died 1740. While crown prince (1706) he married Sophia Dorothea, daughter of the Elector of Hanover, afterwards George I of England. On his accession to the throne, in 1713, he endeavored to increase the army and reform the finances, and became the founder of the exact discipline and regularity which have since characterized the Prussian soldiers. He was very miserly, eccentric, and arbitrary. He opposed Charles XII, and was the protector of the neighboring Protestant states. His ridiculous fondness for tall men in his army is well known. He left behind him an abundant treasury, and an army of about 70,000 men. His affairs were in the greatest order and regularity, and to his energy Prussia was much indebted for that prosperity and success which distinguished her till she was humbled by Napoleon.

Frederick William II, King of Prussia, born 1744; died 1797. He succeeded his uncle, Frederick the Great, in 1786, and shared in the second partition of Poland.

Frederick William III, son of Frederick William II, born 1770; died 1840. During his reign Prussia suffered much at the hands of Napoleon, including defeats at Jena, Eylau, Friedland, etc., and lost a large portion of territory, which, however, was recovered after the fall of Napoleon.

Frederick William IV, King of Prussia, son of Frederick William III, was born 1795; died 1861. He was carefully trained by the best masters in all the leading branches of knowledge and art, civil and military. He took part, though without any active command, in the campaigns of 1813-14. When he succeeded to the throne by the death of his father in 1840 his first proceedings were both of a popular and praiseworthy character. He soon, however, began to pursue a retrograde and absolutist policy. The popular movement which followed the French revolution of 1848 was at first met by the king with firmness, but on the demand of the people that the troops should be withdrawn from the capital, backed by an attack on the arsenal, the king offered concessions, which, however, he retracted on his power becoming more secure. Subsequently his mind gave way, and he sank into a state of hopeless imbecility, which rendered it necessary to appoint his brother William regent of the kingdom. He died without issue, and was succeeded by his brother, who ten years later became emperor of united Germany.

Fredericton (fred'er-ik-tun), the capital of New Brunswick, Dominion of Canada, on the river St. John, about 84 miles from its mouth, and 54 miles N. N. W. of the town of St. John. It is well laid out, and has handsome public buildings, including the government house, the provincial buildings, courthouse, town-hall, cathedral, university, etc. The trade is extensive and increasing, the river being navigable for large steamers. Pop. (1911) 7208.

Frederikshald (frä'dreks-hal), or FREDERIKSHALL, a seaport of Norway, at the mouth of the Tistedal in the Idde-fiord, about 60 miles S. S. E. of Christiania. Immediately to the south stands the fortress of Frederiksteen, at the siege of which Charles XII of Sweden was killed, 30th November, 1718. An obelisk marks the spot. Pop. 11,948.

Fredonia, a village in Chautauqua County, New York, 3 miles S. of Dunkirk. It has large nurseries and canneries, and produces wine, grape juice and flour. Here is a State Normal School. Pop. 5285.

Free-bench, in law, the right which a widow has, in some parts of England, in her husband's copyhold lands, corresponding to dower in the case of freeholds.

Free Church of England, an Episcopal body separate from the Established Church of England, founded in 1844 as a counteracting movement to the tractarian movement. The churches belonging to it, though not numerous, are widely spread. The service is practically identical with that of the evangelical party of the national church. The church is governed by convocation and three bishops.

Free Church of Scotland, a Presbyterian Church organized as a separate body from the Established Church in May, 1843, as the final outcome of long continued dissensions in the church, dating back to the reign of Queen Anne. A proposal for union with the United Presbyterian Church failed in 1873; but a similar proposal with regard to the Reformed Presbyterian Church was successful in 1876.

Free Cities, cities having an independent government of their own, and virtually forming states by themselves; a name given to certain cities of Germany which were members

of the German Confederation, and exercised sovereign jurisdiction within their own boundaries. At the time of the French Revolution the free or 'imperial' cities numbered no fewer than fifty-one. These gradually lost their standing as free cities, and after the incorporation of Frankfort with Prussia in 1866 only three were left, Hamburg, Bremen, and Lübeck. These now rank as city-states of the German empire.

Free Companies, FREE LANCES, names given to the troops of private adventurers who, in the middle ages, organized themselves into bands of mercenary soldiers, and let out their services to the highest bidder. They played their most conspicuous part in Italy, where they were called *Condottieri*.

Free Congregations (Ger. *Freie Gemeinden*), sometimes called 'Protestant Friends,' a sect of German Rationalists, who at first professed to be Christians, but now reject the doctrines of miraculous revelation and a personal deity. There are upwards of 120 congregations of them in Germany, and a few in the United States.

Freedmen (*liberti, libertini*) was the name applied by the Romans to those persons who had been released from a state of servitude. The freedman wore a cap or hat as a sign of freedom (hence the origin of the cap of liberty), assumed the name of his master, and received from him a white garment and a ring. With his freedom he obtained the rights and privileges of a Roman citizen of the plebeian rank, but could not be raised to any office of honor. The title was applied to the freed slaves after the Civil war in the United States.

Freedmen's Bureau, established in the United States in 1865, exercised general supervision over the freedmen and other loyal refugees, protected their rights, found work for them, and provided education and medical treatment. It was abolished in 1870.

Freeland (frē'land), a borough of Luzerne County, Pennsylvania, 9 miles N. of Hazleton. It has machine shops and various factories, with coal-mines in its vicinity. Pop. 6197.

Freeman, EDWARD AUGUSTUS, an English historian and archæologist, born at Harborne, Staffordshire, in 1823, educated at Trinity College, Oxford, of which he was a scholar and fellow. He received various academical and other distinctions, and in 1884 became regius professor of modern history at Oxford. His works, which are very voluminous, include *History of Architecture*, 1849; *History and Conquests of the Saracens*, 1856; *Old English History*, 1869; *Growth of the English Constitution* 1872; *Historical Essays*, 1872-79; *History of the Norman Conquest*, 1867-76; and the *Reign of William Rufus and Accession of Henry I*, 1882. He died in 1892.

Freeman, MARY WILKINS. See *Wilkins, Mary E.*

Freemasonry, a term applied to the organization of a society calling themselves *free* and accepted *masons*, and all the mysteries therewith connected. This society, if we can reckon as one a number of societies, many of which are unconnected with each other, though they have the same origin and a great similarity in their constitution, extends over almost all parts of the globe, and is consequently of the greatest service to travelers who are members of the craft. According to its own peculiar language, it is founded on the practice of social and moral virtue. It claims the character of charity in the most extended sense; and brotherly love, relief, and truth are inculcated in it. Fable and imagination have traced back the origin of freemasonry to the Roman Empire, to the Pharaohs, the Temple of Solomon, the Tower of Babel, and even to the building of Noah's ark. In reality, it took its rise in the middle ages along with other incorporated crafts. Skilled masons moved from place to place to assist in building the magnificent sacred structures—cathedrals, abbeys, etc.—which had their origin in these times, and it was essential for them to have some signs by which, on coming to a strange place, they could be recognized as real craftsmen and not impostors. Freemasonry in its modified and more modern form dates only from the seventeenth century. The modern ritual is said to have been partly borrowed from the Rosicrucians and knights templars, and partly devised by Elias Ashmole, the founder of the Ashmolean Museum. Freemasonry, thus modified, soon began to spread over the world. In 1725 it was introduced into France by Lord Derwentwater; and in 1733 the first American lodge was established. The United Grand Lodge of England recognizes only two species of Freemasonry—the *Craft* and the *Royal Arch*: Scotch, Irish, American, and continental lodges acknowledge higher degrees: but these, with the exception of the *Mark Degree*, are not universal. In ordinary freemasonry there are three grades—those of apprentice, fellow-craft, and master ma-

son—each of which has its peculiar initiatory ceremonies; the last of these grades, however, is necessary to the attainment of the full rights and privileges of brotherhood. It is at present a very flourishing institution in the United States, and had in 1910 nearly 1,400,000 members, being surpassed in membership only by the Odd Fellows' Association. Freemasonry is under the ban of the church in Spain, Italy, and other Catholic countries, and its membership there is small and scattered.

Free Port, a harbor where ships of all nations may enter on payment of a moderate toll, and load or unload. Goods may be stored at first at free ports without paying any duty; the goods may then be either reshipped for export on paying a mere transit duty, or admitted on payment of the usual full customs of the country.

Freeport, a city, the county seat of Stephenson County, Illinois, 112 miles W. by N. of Chicago, on the Pecatonica River and four railroads, possesses railroad shops and manufactures of carriages, windmills, hardware, gasoline engines, etc. Pop. 21,000.

Free Soil, the name of a political party in the United States, founded in 1846 to oppose the extension of slavery to the Territories. It nominated Martin Van Buren for President in that year, but he failed to gain any electoral votes. It had a candidate also in 1852, but was absorbed by the Republican party in 1856.

Free Spirit, BRETHREN OF THE, a sect of heretics which originated in Alsace in the thirteenth century, and quickly became disseminated over Italy, France, and Germany. They claimed 'freedom of spirit,' and based their claims on Rom., viii, 2-14. 'The law of the spirit hath made me free from the law of sin and death.' Thence they deduced that they could not sin, and lived in open lewdness, going from place to place accompanied by women under the name of 'sisters.'

Freestone. See *Sandstone*.

Freethinkers, an epithet applied to the English Deists of the seventeenth and eighteenth centuries who argued for natural as against revealed religion. Anthony Collins (who first made it a name of a party by his *Discourse of Free-thinking*, London, 1713), and his friend, John Toland, are among the chief of the early freethinkers. Another able writer on the same side was Math. Tindal (died 1733), whose *Christianity as Old as the Creation* (1730) caused a great sensation. Lord Bolingbroke and Hume take the lead among advanced freethinkers. In France Voltaire and the encyclopedists D'Alembert, Diderot, and Helvetius led the opposition against revealed religion. The same spirit became fashionable in Germany in the reign of Frederick the Great. The term is now generally applied to designate Rationalists in general, who are to be found among Christians as well as non-Christians.

Freetown, a seaport of West Africa, capital of the British settlement of Sierra Leone, not far from the entrance of the estuary or river of Sierra Leone, in the vicinity of extensive swamps, which make it very unhealthy. Its principal streets are broad and straight, and have a very attractive appearance. Among the public buildings are several churches, a governor's house, and barracks. Pop., 30,000, largely liberated negroes. Only a few hundred of these are Europeans.

Free-trade, the term applied to national commerce when relieved from such interference as is intended to improve or otherwise influence it; that is, unrestricted by laws or tariffs, and not unduly stimulated by bounties. In all countries it was long held to be of importance to encourage native production and manufactures by excluding from their own markets, and from the colonial markets over which they had control, the competing produce and manufactures of other countries. On this theory the great body of British commercial legislation was founded until 1846, when the policy of free-trade was introduced in grain, and afterwards gradually extended by the repeal of the navigation laws in 1849 and other great measures, until nearly all British commercial legislation has been brought into conformity with it. Free-trade can hardly yet be said to have been adopted as a principle of commercial policy by any nation except Great Britain. As an economic principle free-trade is the direct opposite to the principle or system of *protection*, which maintains that a state can reach a high degree of material prosperity only by protecting its domestic industries from the competition of all similar foreign industries. To effect this protecting countries either prohibit the importation of foreign goods by direct legislation, or impose such duties as shall, by enhancing the price, check the introduction of foreign goods. The advocates of what is called *fair trade*, a recent development in Britain, profess a preference for free-trade were it universal or

even common, but in view of the fact that Britain is almost the sole free-trade country in the world, they declare that a policy of reciprocity is required for the protection of British traders and manufacturers. The progress made by Britain since 1846 is adduced by free-trade advocates as a striking proof of the wisdom of the existing policy. See *Protection*.

Free-will, the power of directing our own actions without constraint by necessity or fate, a doctrine maintained in the fields both of theology and of metaphysics. See *Will*.

Freezing (frē'zing), CONGELATION, or SOLIDIFICATION, the transformation of a liquid into a solid under the influence of cold. Each liquid always solidifies at some fixed temperature, which is called its freezing-point, and the solid melts again at the same temperature. Thus the freezing-point and the melting-point, or point of fusion, are the same, and the point is always the same for the same substance. Consequently the freezing-point of water, or the melting-point of ice (32° Fahr.), is taken for one of the fixed points in thermometry. The freezing-point of mercury is 39° below zero, of sulphuric ether 46° below zero, of alcohol 203° below zero Fahr. It has been shown that the increase of pressure upon water, and upon all substances which expand in freezing, will lower the freezing-point; and that such substances as wax, spermaceti, sulphur, and paraffin, which contract in freezing, have the freezing-point raised by pressure. Artificial freezing is attained by the liquefaction of solids or the evaporation of liquids. These processes absorb heat, and by abstracting it from the surrounding substances freeze the latter. Among freezing mixtures are: (1) two parts of pounded ice or fresh snow and one part of common salt, which causes the thermometer to fall to —4°; (2) equal parts of water, of powdered crystallized nitrate of ammonia, and of powdered crystallized carbonate of soda, which produces a cold of —7°; (3) three parts of snow with four parts of crystallized chloride of calcium, producing a temperature of —54°; while (4) with a mixture of liquid nitrous oxide and carbon disulphide a temperature of —220° is reached. Ice-making machines are now in common use in the United States, large quantities of artificial ice being made at prices enabling it to compete with natural ice.

Freiberg (frī'berh), a German mining town, the center of the mining district of Saxony, 20 miles W. S. W. of Dresden, near the Mulde. There are still remains of its former walls, towers, and ditches, but their site has mostly been converted into a promenade. The principal buildings and establishments are the cathedral, the mining academy with a museum attached, the townhouse, the castle (now a military magazine), the royal silver refinery, etc. The Freiberg district yields silver, copper, lead, and cobalt, and the city has large silver-smelting works, besides numerous manufactories. Pop. 30,896.

Freiburg (frī'burh), or FREIBURG IM BREISGAU, a town of Baden, on the Dreisam, 42 miles S. S. E. of Strasburg. It consists of the town proper, still possessing some remains of fortifications, and of two suburbs. The chief buildings are the cathedral, a large and beautiful Gothic structure, with a fine portal richly sculptured, and surmounted by a tower with a spire of exquisite open work 380 feet high; the Ludwigskirche; the university, founded in 1456; the museum, theater, grand-ducal palace, etc. The manufactures are numerous, but not individually of great extent. Pop. (1910) 83,324.

Freiburg, a canton and town of Switzerland. See *Fribourg*.

Freienwalde (frī'en-vâl-de), a town of Prussia, district of Potsdam, with a chalybeate spring and bathing establishment in the vicinity. Pop. 7995.

Freight (frāt), the sum paid by a merchant or other person hiring a ship or part of a ship, for the use of such ship or part during a specified voyage, or for a specified time; also any sum charged for the transportation of goods, and the goods themselves, however transported.

Freiligrath (frī-lih-rät), FERDINAND, German lyric poet, born at Detmold, 1810; died at Cannstadt, in Würtemberg, 1876. In 1838 he published at Mainz a volume of his collected poems, which proved successful and gained him a pension, which he relinquished on the publication of his *Glaubensbekenntnis* ('Confession of Faith'), the republican character of which caused his prosecution and flight to London. He returned to Germany in 1848 and took part in the revolutionary movements, publishing the political poems *Die Revolution*, *Februarklänge*, and *Die Todten an die Lebenden*. The last of these led to his being put on trial for treason. This trial, in which he was acquitted, is memorable for another reason, being the first jury trial ever held in Prussia. From 1851 till 1867 Freiligrath again resided in England, but his last years were spent

at Cannstadt. Many of his songs are yet popular. Germany is indebted to him for many admirable translations from foreign languages, as from Burns, Tannahill, Moore, Hemans, Shakespere, Longfellow, Walt Whitman, and Victor Hugo.

Freising (frī'zing), a town of Bavaria, on the left bank of the Isar, 21 miles N. N. E. of Munich. It has a fine old cathedral church. Pop. (1905) 13,538.

Fréjus (frā-zhüs; ancient *Forum Julii*), a town, France, dep. Var, on the Mediterranean, 45 miles N. E. of Toulon. Pop. (1906) 3430.

Frelinghuysen (frē-ling-hī'sen), the name of several Americans of note.—(1) FREDERICK, born in New Jersey in 1753, died in 1804. He was a member of the Continental Congress during most of the Revolutionary war, served as a captain in the army, took part in 1796 in the expedition against the Whisky Insurrection, and was United States senator, 1793-96. (2) THEODORE, a son of the former, was born in Millstone, New Jersey, in 1787, died in 1862. He commanded a company of volunteers in the war of 1812, and was elected to the United States Senate in 1829. He was made Chancellor of the University of New York in 1838, and in 1844 was nominated for Vice-President of the United States by the Whig party. He was defeated, with Henry Clay, the candidate for President. In 1850 he became president of Rutgers College. (3) FREDERICK THEODORE, a nephew of the last named, was born at Millstone, New Jersey, in 1817, died in 1885. He gained eminence as a lawyer, was attorney-general of New Jersey 1861-66, United States Senator 1868-77, and Secretary of State in President Arthur's cabinet 1881-85.

Fremont (frē-mont), a city, county seat of Dodge County, Nebraska, 32 miles W. N. W. of Omaha. It has a large trade in grain and lumber, and has dairying and agricultural interests and various manufactures. Pop. 10,000.

Fremont, a city, county seat of Sandusky County, Ohio, 90 miles S. E. of Toledo, on the river Sandusky. Lines of steamers run to the principal ports of Lake Erie. It is in a productive oil and natural gas region and has numerous industries. A hydro-electric power plant was completed in 1913 at a cost of $1,500,000. Pop. 12,000.

Frémont, JOHN CHARLES, explorer, born at Savannah, Georgia, in 1813. He conducted five separate and adventurous expeditions which explored the passes of the Rocky Mountains. In the year 1845 he crossed the mountains by a new line, scaling the summits south of the South Pass and crossed 3500 miles of country, much of it in sight of eternal snows, discovering the grand features of Alta California, its great basin, the Sierra Nevada and the valleys of San Joaquin and Sacramento. He was again in California during the Mexican war and did much in securing that country for the United States. In 1848 he purchased a large auriferous tract called the Mariposa estate, on which he settled in 1849. He conducted a final expedition to the Pacific in 1853, and in 1856 he was the first candidate of the newly-organized Republican party for the Presidency, but was defeated by the Democratic candidate. In 1861, on the outbreak of the Civil war, he was appointed a major-general of volunteers. He then, as commander of the western Union army, marched into Missouri with the view of encountering General Price's Confederate force then in possession of that state, but an order issued by him for the confiscation of the property and emancipation of the slaves of those in arms against the government was disapproved by the President and he was removed from the command and sent to the East, where he fought an indecisive battle at Cross Keys. Soon after he resigned his command, being unwilling, for personal reasons, to serve under General Pope. He was appointed Governor of Arizona in 1878, and commissioned major-general in the regular army, retired, in 1890. He died in the same year.

French, SIR JOHN DENTON PICKSTONE, a British soldier, born at Ripple Vale, Kent, in 1852. He entered the army in 1874; served in the Sudan campaign and in the Boer war, where he gained the reputation of a daring cavalry leader. At the outbreak of the European war he was appointed commander-in-chief of the British land forces operating in France.

French Berries, known also as *Avignon berries* and *yellow berries*, the drupe of the *Rhamnus alaternus*, one of the species of buckthorn. In size they are rather less than a pea, have a bitter and astringent taste and are used by dyers as a yellow coloring matter. The berries are imported from France and also from Persia, whence they are sometimes called Persian berries.

French Chalk, scaly talc, a variety of indurated talc, in masses composed of small scales of a

pearly-white color; used by tailors for marking cloth and removing grease.

French Guinea, a colony of France, lies on the W. coast of Africa between Portuguese Guinea and the British colony of Sierra Leone, and extends inland to about 7½° W. The highland region of Futa Jallon, which begins about 80 m. from the coast, is rich in gold and cattle. The chief products of the colony are palm-oil and nuts, millet, earthnuts, gum, rubber, and coffee. The principal exports are rubber, cattle, ground-nuts, and palm-kernels. A railroad (366 m. long) from Konakry, the capital, to the Niger was opened in 1911. Area, 95,000 sq. m.; pop. 1,500,000.

French Language and Literature. See *France, Language of,* and *Literature of.*

French Revolution, a political revolution for which the intellectual movement of the 18th century, connected with the names of Montesquieu, Diderot, Voltaire and Rousseau, had prepared the way. The direct causes, however, were political and economic rather than intellectual. See *France, History.*

Freneau (fre-nō), PHILIP, poet, was born in New York city in 1752. Graduated at Princeton in 1771. Captured by a British cruiser in 1780, he wrote *The British Prison Ship.* As editor of the *National Gazette* his virulent attacks on the Federalists aroused Hamilton's anger. His poems were numerous, chiefly of Revolutionary times. He died in 1832.

Frere (frēr), SIR HENRY BARTLE EDWARD, statesman and administrator, born at Clydale, Wales, 1815; died at Wimbledon, 1884. He entered the East India Company's civil service in 1833; mastered the native languages with great rapidity, and introduced important improvements into the system of tax collection. He rendered valuable services during the mutiny, at the close of which he was nominated to the viceroy's council at Calcutta. In 1872 he negotiated a treaty with the Sultan of Zanzibar, abolishing the slave trade in that ruler's dominions. In 1877 he went to South Africa as commissioner for the settlement of native affairs, but this mission was a failure. He was the author of a life of his uncle, John Hookham Frere, numerous lectures, pamphlets, etc.

Frere, JOHN HOOKHAM, born at London in 1769; died at Malta in 1846. He is now chiefly remembered as one of the writers in the *Anti-Jacobin Review* at the close of the eighteenth century; and afterwards connected with the establishment of the *Quarterly Review* in 1809. A satirical poem published by him in 1817, entitled *Prospectus and Specimen of an Intended National Work, by William and Robert Whistlecraft,* followed by another entitled *The Monks and the Giants,* obtained in their day much popularity. His translations in verse of some of the comedies of Aristophanes are well known for their remarkable excellence. Mr. Frere entered parliament in 1796, and succeeded Canning as under-secretary for foreign affairs in 1799. In 1818-19 he acted as British ambassador in Spain, and subsequently held other diplomatic posts in Portugal and Prussia. The latter years of his life were spent in Malta.

Fréron (frā-rōn), ELIE CATHARINE, a French journalist, born at Quimper in 1719; died at Paris 1776. In 1746 he commenced a periodical entitled *Lettres de Madame la Comtesse de ———*; this, with various interruptions and change of name, was continued until his death. He may be called the founder of newspaper criticism in France; and had a lifelong conflict with Voltaire and the encyclopedists.

Fresco Painting (fres-kō), a method of mural painting in water colors on fresh or wet grounds of lime or gypsum. Mineral or earthy pigments are employed, which resist the chemical action of lime. In drying, the colors are incorporated with the plaster, and are thereby rendered as permanent as itself. In producing fresco paintings, a finished drawing on paper, called a cartoon, exactly the size of the intended picture, is first made, to serve as a model. The artist then has a limited portion of the wall covered over with a fine sort of plaster, and upon this he traces from his cartoon the part of the design suited for the space. As it is necessary to the success and permanency of his work that the colors should be applied while the plaster is yet damp, no more of the surface is plastered at one time than what the artist can finish in one day. A portion of the picture once commenced, needs to be completely finished before leaving it, as fresco does not admit of retouching after the plaster has become dry. On completing a day's work, any unpainted part of the plaster is removed, cutting it neatly along the outline of a figure or other definite form, so that the joining of the plaster for the next day's work may be concealed. The art is very ancient, remains of it being found in India, Egypt, Mexico, etc. Examples of Roman frescoes are found in Pompeii and

other places. After the beginning of the fifteenth century fresco painting became the favorite process of the greatest Italian masters, and many of their noblest pictorial efforts are frescoes on the walls of palaces and churches. Some ancient wall-paintings are executed in what is called *Fresco Secco*, which is distinguished from true fresco by being executed on dry plaster, which is moistened with lime water before the colors are applied. Fresco painting has in recent years again been revived, and works of this kind have been executed in the British Houses of Parliament and other public and private buildings, more especially in Germany.

Fresnel (frā-nel), AUGUSTIN JEAN, a celebrated French physicist, born 1788; died 1827. He began to experiment upon the nature of light about 1815, received a prize in 1819 from the Academy of Sciences for his treatise *On the Diffraction of Light*, and in the end did for physical optics what Newton had done for astronomy, his experiments tending to prove the truth of the theory that light consists in the vibration of an elastic medium. Up to that date the emission theory of Newton had held sway. The honor for this great result he shares in common with the English physicist, Dr. Thomas Young. He made the first successful use of lenses in the lamps of lighthouses, inventing the illuminating apparatus, which is now used throughout the civilized world.

Fresnillo (fres-nēl'yo), a city of Mexico, in state of and 30 miles N. N. W. of Zacatecas. In this vicinity are celebrated silver and copper mines. Pop. 13,000.

Fresno (frez'nō), a city, seat of Fresno County, California, 208 miles S. E. of San Francisco. It is in a productive grain and fruit region and is especially noted for the raisin product of its vicinity and for its wine. It ships fruits, green and dried, cereals and wool. Pop. 30,000.

Fret, a kind of ornament much employed in Grecian art and in sundry modifications common in various other styles. It is formed of bands or fillets variously combined, but most frequently consists of continuous lines arranged in rectangular forms. Sometimes called *key ornament*.

Frets, certain short wood, ivory, or metal crossbars on the fingerboards of stringed instruments, as the guitar, etc., which regulate the pitch of the notes. By pressing the string down to the fingerboard behind a fret only so much of the string can be set in vibration as lies between the fret and the bridge.

Freudenstadt (froi'den-stât), a town of Würtemberg, 40 miles S. W. Stuttgart, with a fine old church and a town-house. Pop. 7076.

Freya (frī'ya), in the northern mythology, the goddess of love and wife of Odhr; she was a friend of sweet song, and loved to hear the prayers of mortals. She had a famous necklace, much celebrated in Scandinavian legends. She is often confounded with Frigga.

Freyberg. See *Freiberg*.

Freyburg. See *Freiburg*.

Freycinet (frā-si-nâ), CHARLES LOUIS DE SAULCES DE, a French statesman, born at Foix (Ariège), in 1828. He was trained as an engineer, and held several important appointments; he was elected to the senate in 1876; was minister of public works, 1877; minister for foreign affairs, 1879, and president of the council and minister for foreign affairs for longer or shorter periods in 1882 and 1886. He is the author of several important works on engineering.

Freytag (frī'tâh), GUSTAV, a German poet, dramatist, and novelist, born 1816. He was editor of the *Leipzig Grenzboten* from 1848 to 1870, and has produced numerous successful plays, tales, and poems. Among his more famous works are *Soll und Haben* ('Debit and Credit'); *Bilder aus der Deutschen Vergangenheit* ('Pictures from the German Past'); *Die Verlorene Handschrift* ('The Lost Manuscript'), and *Die Ahnen* ('Our Ancestors'), a series of six romances illustrative of old German life. Died 1895.

Friar (frī'ar; Fr. *frère*, Lat. *frater*, brother), in the Roman Catholic Church an appellation common to the members of all religious orders, but more especially to those of the four mendicant orders, viz. (1) Minors, Gray Friars, or Franciscans; (2) Augustines; (3) Dominicans or Black Friars; (4) White Friars or Carmelites.

Fribourg, or FREIBURG (frē-bōr', frī'bụrh), a canton of Switzerland, surrounded by the cantons of Berne and Vaud, except a narrow part, which touches the Lake of Neufchâtel. The southern part is mountainous, the northern part more level. The whole canton abounds in excellent pasturage, and cattle breeding and dairy husbandry are the chief occupations of the inhabitants. Area, 644 square miles; pop. 127,951, of whom the great majority are Roman Catholics speaking French. The capital, which has the same name, picturesquely situated on the Saane, 17

miles S. W. Berne. It stands partly on a rocky eminence at the edge of a ravine nearly surrounded by the river, which is here spanned by a suspension bridge 168 feet above the water. The Gothic church of S. Nicholas contains one of the finest organs in Europe. Pop. 15,794.

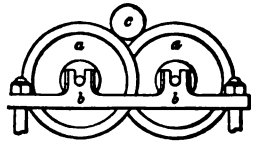
Fricassee (fri-kas-sē), a dish of food made by cutting chickens, rabbits, or other small animals into pieces, and dressing them with a strong sauce in a frying pan or a like utensil.

Fricative (frik'a-tiv), a term applied to certain letters produced by the friction of the breath issuing through a narrow opening of the organs of articulation, as *f*, *v*, *s*, *z*, etc.

Friction (frik'shun), in physics, the effect of rubbing, or the resistance which a moving body meets with from the surface on which it moves. Friction arises from the roughness of the surface of the body moved on and that of the moving body. No such thing can be found as perfect smoothness of surface in bodies. In every case there is, to a less or greater extent, a roughness or unevenness of the parts of the surface, arising from peculiar texture, porosity, and other causes, and therefore when two surfaces come together the prominent parts of the one fall into the cavities of the other. This tends to prevent or retard motion, for in dragging the one body over the other an exertion must be used to lift the prominences over the parts which oppose them. What is called the *coefficient of friction* for any two surfaces is the ratio that subsists between the force necessary to move one of these surfaces horizontally over the other and the pressure between the two surfaces. Thus, the coefficient of friction for oak and cast-iron is 38 : 100, or .38. Friction plays a most important part in nature and art; for instance, but for it threads could not be made nor textile fabrics manufactured.

Friction-rollers, a name common to any small rollers or cylinders employed to convert sliding motion into rolling motion. Such cylinders are often placed under heavy bodies when they are required to be moved any short distance on the surface of the ground; and, in machinery, the same method is occasionally employed to diminish the friction of a heavily loaded axis. In that case a number of small cylinders are inclosed round the axis, and partake of its motion.

Friction-wheels, in machinery, two simple wheels or cylinders intended to assist in diminishing the friction of a horizontal axis. The wheels are simply plain cylinders (*a*, *a*) carried on parallel and independent axes (*b*, *b*). They are disposed so as to overlap pair and pair at each end of the main axis (*c*), which rests in the angles thus formed by the circumferences.



Friction-wheels.

The axis, instead of sliding on a fixed surface, as in ordinary cases, carries round the circumferences of the wheels on which it is supported with the same velocity as it possesses itself, and in consequence the friction of the system is proportionally lessened.

Friday (frī'dā), the sixth day of the week, from the Anglo-Saxon. *Frige-dæg*, the day sacred to *Frigga* or to *Freya*, the Saxon Venus. See *Good Friday*.

Friedland (frēd'lânt). (1) A town of Northern Bohemia. Wallenstein was created Duke of Friedland in 1622. Pop. 6241. (2) A small town of East Prussia, 28 miles S. E. of Königsberg, on the river Alle. Pop. 2824. The Russians under Benningsen were here defeated on the 14th June, 1807, by the French under Napoleon. (3) A town of Mecklenburg-Strelitz, 30 miles N. E. of Strelitz. Pop. 7143.

Friedrich (frēd'rih), the German form of *Frederick*.

Friedrichsthal (frēd'rihs-tāl), a town in the extreme south of Rhenish Prussia, with glassworks and coal and iron mines. Pop. 5871.

Friendly Islands, or TONGA ISLANDS, a cluster in the South Pacific Ocean, between lat. 18° and 23° S., and lon. 173° and 176° W. They consist of three groups, which are divided from each other by two narrow channels, and number altogether about 150, with a collective area of about 400 sq. miles. The largest island is Tongatabu, in the S. group, with an area of 128 sq. miles, and containing the capital, Nukualofa. Vavao, in the N. group, which is named after it, is next to Tongatabu in size; the central group is called Hapai. The islands are nearly all volcanic, with coral reefs and rocks about them; earthquakes and volcanic eruptions are frequent; during one of which, in Oct., 1885, a new island 2 miles in circumference suddenly appeared.

These islands were discovered in 1643 by Tasman, but received their collective name from Cook. They are now governed by a native Christian prince. The trade is considerable, the chief exports being copra, coffee, and wool. Population, 20,677, including about 200 foreigners.

Friendly Societies, societies formed for the mutual advantage of the members, and based on the principle that it is by the contribution of the savings of many persons to one common fund that the most effectual provision can be made for casualties affecting, or liable to affect, all the contributors.

Mutual provident association, on the voluntary principle and in a friendly society form, as an economic duty, is strictly confined at present to the English-speaking races, though attempts are being made to introduce the system in both Italy and Austria-Hungary. Provident insurance, indeed, is enforced throughout the German empire among all classes of workmen, but only as a form of state socialism enacted by law and largely subsidized by the employers. In France the method employed is the individualistic system of savings banks. See *Fraternal Societies.*

Friends. See *Quakers.*

Fries (frēs), ELIAS MAGNUS, a Swedish botanist, born 1794; died 1878. He published, among other volumes, a great work on fungi.

Fries (frēs), JAKOB FRIEDRICH, a German philosopher, born 1773; died 1843. His works are numerous, the most important being *Neue Kritik der Vernunft, System der Philosophie als evidente Wissenschaft,* and *Wissen, Glaube und Ahnung.*

Fries, JOHN, a German-American, leader of FRIES REBELLION, born in Bucks county, Pa., in 1764; died in 1825. He took a keen interest in local politics, and when, in 1798, Congress voted a direct tax of $2,000,000, and Pennsylvania's quota was fixed at $237,000, to be levied on houses and lands, he and other Germans of the counties of Montgomery, Lehigh, Bucks, and Berks offered a strenuous opposition. When the federal officers came to collect the tax, Fries put himself at the head of the opposition and formed armed companies. These seized and punished such officers as attempted to carry out the law. At a meeting, held in February, 1798, at Lower Milford, he promised to raise 700 men, and soon after, at the head of a company, he arrested the government assessors and liberated several prisoners. The next day, at Bethlehem, he forced the United States marshal to liberate his prisoners by threatening to resort to firearms. The militia was consequently called out, and Fries and others were taken prisoners. He was twice tried for high treason for this offense, and sentenced each time to death, but in April, 1800, was pardoned by President Adams.

Friesland (frēz'land), the most northerly province of Holland. The area is 1281 sq. miles. Leeuwarden is the capital. Pop. 342,286. See *Frisians.*

Frietchie, BARBARA, was born at Lancaster, Pa., in 1766; died in 1862. In 1806 she married John Caspar Frietchie, of Frederick, Md. Whittier's celebrated poem *Barbara Frietchie* (1863), founded upon the story, is now regarded as of doubtful authenticity, or, at least, on a confusion between Mrs. Frietchie and a Mrs. Quantrell. Mrs. Frietchie, however, did greet the Union troops by waving a flag from the porch of her house.

Frieze (frēz), a kind of coarse woolen stuff or cloth, with a nap on one side.

Frieze (frēz), in architecture, that part of the entablature of columns which lies between the architrave and cornice. It is a flat member or face, usually enriched with figures or other ornaments of sculpture. See *Entablature.*

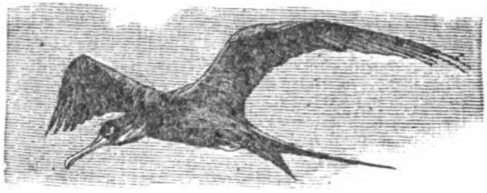
Frigate (frig'at), originally a Mediterranean vessel propelled by sails and oars; afterwards a ship of war, larger than a sloop or brig and less than a ship of the line, usually carrying her guns (which varied from about thirty to fifty or sixty in number) on the main deck and on a raised quarter-deck and forecastle, or having two decks. Such ships were often fast sailers, and were much employed as cruisers in the great wars of the eighteenth and early part of the nineteenth centuries. The name is no longer in use for naval vessels.

Frigate-bird, or MAN-OF-WAR BIRD (*Tachypĕtes aquilus*), an American tropical web-footed bird of the family Pelecanidæ, found on the Atlantic and Pacific coasts. Including the long tail, the male bird reaches 3 feet in length, but the body is comparatively small. The bill is longer than the head, strong, hooked at the point, and sharp. In proportion to their size their wings are longer than in any other bird, having an extent of 7 feet or more. Their flight is powerful and graceful; they neither swim nor wade, but catch the flying-fishes in the air, and cause fishing birds to disgorge their prey, which they dex-

terously seize as it falls. Their general color is black, but the under feathers of the females are white.

Frigga, or FRIGG, in northern mythology, the wife of the god Odin, the goddess after whom Friday is named. She is a goddess in some respects corresponding with Venus, and is often confounded with Freya.

Frilled Lizard, an Australian lizard, *Chlamydosaurus Kingii*, so called from a curious membrane-like ruff or tippet round its neck, covering its shoulders, and which lies back in plaits when the animal is tranquil, but which elevates itself when it is irritated or frightened. A full-grown specimen is about three feet in length.



Frigate-bird (*Tachypètes aquilus*).

Frimaire (frē-mār; Fr., from *frimas*, hoar-frost), the third month of the French republican calendar, dating from September 22, 1792. It commenced November 21, and ended December 20.

Fringe-tree (*Chionanthus Virginica*), a small tree belonging to the same natural family with the olive, and having snow-white flowers which hang down like a fringe, inhabiting America from lat. 39° to the Gulf of Mexico. It is frequently cultivated in gardens as an ornamental plant. Four other species of *Chionanthus* are known, two of which inhabit the West Indies, the third Ceylon, and the fourth Australia.

Fringillidæ (frin-jil'i-dē), a large family of conirostral birds, comprising the finches (which see).

Frisians (fris'i-anz), a German tribe who, about the beginning of the Christian era, occupied the territory between the mouths of the Rhine and the Ems. They became tributaries of Rome under Drusus, and lived for some time on friendly terms with their conquerors, but were driven to hostilities by oppression. In time they extended as far eastward as Slesvig, and even made settlements on the Firth of Forth, and probably in other parts of Northern Britain. About the end of the seventh century the Frisians in the southwest were subdued by the Franks under Pépin d'Héristal, who compelled them to accept Christianity. A century later the eastern branch of the tribe was conquered and Christianized by Charlemagne. Their country was divided into three districts, two of which were annexed on the division of the Carlovingian empire to the possessions of Louis the German, and the other to those of Charles the Bald. The latter part was called West Frisia. (W. Friesland), and the two former East Frisia (E. Friesland). Their modern history is chiefly connected with Holland and Hanover. The *Frisian Language* holds in some respects an intermediate position between Anglo-Saxon and Old Norse. Of all the Teutonic dialects it is the most nearly related to English. Its ancient form exists only in some remarkable collections of laws. Three dialects of it are now recognized: the West Frisian, spoken in the Dutch province of Friesland, about Leeuwarden, Bolsward, etc., and used to some extent in literature; the East Frisian, spoken between the mouths of the Ems and Weser; and the North Frisian, spoken on the west coast of Schleswig and South Jutland, and on the islands Sylt, Föhr, Amrun, etc.

Frit, the matter of which glass is made after it has been calcined. (See *Glass.*) The term is also applied to semivitrified earthenware, often pounded and used for glaze.

Frit, the *Chlorops* or *Oscinis frit*, a small greenish-black fly, the larvæ of which do great damage to barley crops in some parts of the north of Europe. It is nearly allied to the corn or wheat fly known in Britain.

Frith. See *Firth*.

Frith, WILLIAM POWELL, born at Studley, near Ripon, 1819. After 1840, when he exhibited *Malvolio before Olivia*, at the Royal Academy, he produced a great number of scenes from Shakespere, Molière, Dickens, Sterne, Goldsmith, etc., besides his immensely popular pictures, *Coming of Age in the Olden Time* (1849), *Life at the Seaside* (1854), *The Derby Day* (1858), *The Railway Station* (1862), *Before Dinner at Boswell's Lodgings* (1868), *The Private View at the Royal Academy* (1881), etc. He was commissioned by the queen

to paint the marriage of the Prince of Wales. He was elected R. A. in 1852, and was a member of several foreign academies. He died in 1909.

Frith Gilds, among the Anglo-Saxons, voluntary associations of neighbors for purposes of order and self-defense. They repressed theft, traced stolen cattle, and indemnified parties robbed from a common fund raised by subscription of the members.

Frithjof (frēt'yof), an Icelandic hero, supposed to have lived in the eighth century. After a series of adventures, recorded in an ancient Icelandic saga of the thirteenth century, he marries Ingebjörg, the widow of the king Hring. The story forms the groundwork of Tegner's popular poem, *Frithjof's Saga*, and has been frequently translated.

Fritillary (frit'i-la-ri; *Fritillaria*), a genus of plants, nat. order Liliaceæ, natives of north temperate regions. *F. Meleagris*, or common fritillary, is found in meadows and pastures in the eastern and southern parts of England. Several species, as *F. imperialis* or crown-imperial, are cultivated in gardens, chiefly introduced from Persia and the warmer parts of Europe.

Fritillary, the popular name of several species of British butterflies. The *Argynnis paphia* is the silver-washed fritillary; the *A. aglaia* is the dark-green fritillary; the rare and much-prized *A. lattonia* is the queen-of-Spain fritillary.

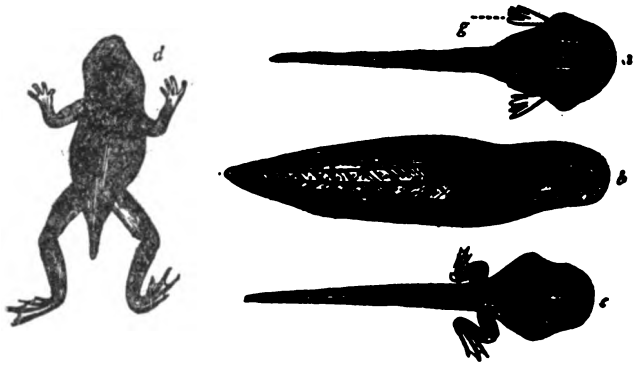
Friuli (fri-ö'lē), a formerly independent duchy at the head of the Adriatic, now forming part of Italy and Austria. It was one of the most important duchies of the Longobard Kingdom, and up to the fifteenth century, when it was conquered by Venice and its territories dismembered, it retained a considerable degree of independence. The inhabitants, called Furlani, are Italian for the most part, but speak a peculiar dialect.

Frobisher (frob'ish-er), SIR MARTIN, one of the great Elizabethan navigators, born near Doncaster, England, about 1535; died at Plymouth, 1594. He made three expeditions to the Arctic regions for the purpose of discovering a northwest passage to India, and endeavored to found a settlement north of Hudson Bay, hopes of immense wealth to be found in these northern regions having taken the public fancy. In 1585 he accompanied Sir Francis Drake to the West Indies. At the defeat of the Spanish armada in 1588 he commanded one of the largest ships in the fleet, and was honored with knighthood for his services. In the years 1590 and 1592 he commanded squadrons against the Spaniards and took many rich prizes. In 1594 he was sent to the assistance of Henry IV of France, when, in an attack on a fort near Brest, he was mortally wounded.

Froebel (freu'bēl), FRIEDRICH WILHELM AUGUST, a German educationist, born in 1782; died in 1852. After an unsettled and aimless youth, and with somewhat imperfect culture, he started teaching, and soon developed a system which has become famous under the name of *Kindergarten* (which see). He is the author of *Die Menschenerziehung* ('Human Education'), and *Mutter- und Koselieder*, a book of poetry and pictures for children. A Froebel Society, for the promotion of the kindergarten system, was established in 1874.

Frog, the common English name of a number of animals belonging to the class Amphibia, having four legs with four toes on the forefeet and five on the hind, more or less webbed, a naked body, no ribs, and no tail. Owing to the last peculiarity frogs belong to the order of amphibians known as Anura or tailless Amphibia. The tongue is fleshy, and is attached in front to the jaw, but is free behind, so that the hinder extremities of the tongue can be protruded. Frogs are remarkable for the transformations they undergo before arriving at maturity. In the spring the spawn is deposited in ponds and other stagnant waters in large masses of gelatinous matter. These masses, with black globules scattered through them, soon manifest change, and after a time the young escapes as a tadpole, an animal with short body, circular suctorial mouth, and long tail, compressed from side to side. Gills project on either side of the head from a cleft which answers in position to the gill opening of fishes. The hindlimbs first appear as buds, later the forelimbs project, the gills disappear, the lungs becoming more fully developed; the tail gradually shrinks and falls off, and the animal, which was at first fish-like, then closely resembled a newt (or tailed Amphibian), finally assumes the adult or tailless form. The mature frog breathes by lungs, and cannot exist in water without coming to the surface for air. The only British species is the common frog (*Rana temporaria*), but the tribe is very numerous, other varieties being the edible frog (*R. esculenta*) of the south of Europe, eaten in France and South Germany, the hind quarters being the part chiefly used; the bull-frog

of America (*R. pipiens*), 8 to 12 inches long, so named from its voice resembling the lowing of a bull; the blacksmith frog of Janeiro, the Argus frog of America, etc. Of the tree-frogs most belong to the genus *Hyla*. (See *Tree-frog*.) Frogs swim with rapidity, and move by long bounds, being able from the power of the muscles of their hind legs to leap many times their own length.



DEVELOPMENT OF THE COMMON FROG. *a*, Tadpole, viewed from above, showing the external branchiæ (*g*); *b*, Side view of a somewhat older specimen, showing the fish-like tail; *c*, Older specimen, in which the hind-legs have made their appearance; *d*, Specimen in which all the limbs are present, but the tail has not been wholly absorbed. (After Bell.)

Frogfish. See *Angler-fish*, and also *Cheironectes*.

Frogspit. Same as *Cuckoo-spit*.

Frohsdorf. See *Froschdorf*.

Froissart (frwȧ-sȧr), JEAN, a French poet and historian, was born in 1337 at Valenciennes; died in Flanders between 1400 and 1410. He received a liberal education, and took orders in the church, but his inclination was more for poetry and gallantry. At the age of eighteen he went to England, where, having already the reputation of being a gay poet and narrator of chivalric deeds, he was received with great favor, Philippa of Hainault, wife of Edward III, declaring herself his patroness. After returning to the continent and traveling for some time, he again visited England, and in 1361-66 he was secretary to the queen. He also visited Scotland, and was entertained by King David Bruce, and William, Earl of Douglas. In 1366 he left England and again traveled. After the death of Queen Philippa, Froissart became curé of Lestines in Hainault, and was patronized by Wenceslaus, Duke of Brabant, who was himself a poet, and of whose verses, united with some of his own, Froissart formed a sort of romance called *Meliador*. On the death of Wenceslaus he entered the service of Guy, Count of Blois, who gave him the canonry of Chimay, and induced him to take in hand the history of his own time. After twelve years of a quiet life he again began his travels, chiefly for the purpose of collecting further matter for his *Chronicle*, and he again visited England after a lapse of forty years. Little is known of the closing part of his life, which is said to have terminated at Chimay. His *Chronicle*, which reaches down to 1400, gives a singularly vivid and interesting picture of his times, and also presents his own character in a pleasing light. The best edition of his *Chronicle* is that of Buchon, which also contains his collected *Poésies* (Paris, 1835-36, three vols.). The earliest, and in some respects the best, English translation is that of Lord Berners (London, 1525), although that by Thomas Johnes (1803-5) is more exact.

Frome (frōm or frŏm), or FROME-SELWOOD, a town of England, County Somerset, on a small river of the same name, 19 miles southeast of Bristol. The staple manufactures are woolen cloths. Pop. (1911) 10,901.

Fronde (frond), a French party during the minority of Louis XIV, which waged civil war against the court party on account of the heavy fiscal impositions laid on the people by Cardinal Mazarin, whom the queen-mother had appointed prime-minister after the decease of Louis XIII (1648). At the head of the Fronde stood the Cardinal de Retz (which see), and latterly the Prince Louis Condé. The result of this contest, which lasted from 1648 to 1654, served only to strengthen the royal power. The name is from Fr. *fronde*, '*a sling*,' a member of the parliament having likened the party to boys slinging stones in the streets, but who

dispersed on the appearance of the authorities.

Frontinus (fron-tī'nus), SEXTUS JULIUS, a Roman of patrician descent, born about A.D. 40; died 106. He was governor of Britain from 75 to 78, and distinguished himself in the wars of the Silures. He appears to have been twice consul, and was appointed by Nerva to superintend the aqueducts, on which he also wrote. His *De Stratagematibus*, a treatise on war, and his *De Aquæductibus Urbis Romæ* are well known.

Fronto (fron'tō), MARCUS CORNELIUS, a Roman orator and rhetorician of the second century after Christ, born at Cirta in Numidia. Having removed to Rome, he won the special favor of Hadrian and Antoninus Pius, and was entrusted with the education of the imperial princes Marcus Aurelius and Lucius Verus. His extant remains consist chiefly of some letters to these princes.

Froschdorf (frosh'dorf; called by the French *Frohsdorf*), a village in Lower Austria, on the river Leitha, about 30 miles from Vienna. It is remarkable for its magnificent castle, which has acquired a kind of political importance since 1844, when it became the headquarters of the Bourbon party. It was the favorite residence of the late Comte de Chambord, who greatly improved and beautified the interior.

Frosinone (frō-zi-nō'nā), a town of Italy, near the left bank of the Cosa, 50 miles E. S. E. of Rome. Pop. of commune 11,191.

Frost is the name we give to the state of the weather when the temperature is below the freezing point of water (32° F.). The intensity of the cold in frost is conveniently indicated by the popular expression so many *degrees of frost*, which means that the temperature of the atmosphere is so many degrees below the point at which the freezing of water commences. Frost is often very destructive to vegetation, owing to the fact that water, which is generally the chief constituent of the juices of plants, expands when freezing, and bursts, and thus destroys the vesicles of the plant. In the same way rain-water, freezing in the crevices of rocks, breaks up their surfaces, and often detaches large fragments. Hoar-frost is frozen dew. It may either freeze while it is falling, when it is found loosely scattered on the ground; or being deposited as dew in the early part of the night it may freeze during a subsequent part of it, owing to radiation. It is generally seen most profusely in spring and autumn; because at those times, while on clear nights the cold is sufficient to freeze the dew, the days are at the same time sufficiently warm to cause a very considerable quantity of moisture to evaporate into the air.

Frostbite, a condition caused by the action of frost on the human body. It is generally local and partial, varying from ordinary chilblain to complete death of the part frozen. The simplest treatment consists in slowly coaxing back the vitality by friction.

Frostburg (frost'burg), a town of Allegany Co., Maryland, 11 miles west of Cumberland. It is in a mountainous region, and coal is extensively mined. It has iron and firebrick works and is the seat of a state normal school. Pop. 6028.

Frosted Glass, glass roughened on the surface, so as to destroy its transparency, in consequence of which the surface has somewhat the appearance of hoar-frost.—The term *frosted* is also applied to the dead or lusterless appearance of gold and silver jewelry when the surface is unpolished.

Frothfly, FROTH-HOPPER, the common name of insects of the family Cercopidæ, the larvæ and pupæ of which are found in frothy exudation on plants. See *Cuckoospit*.

Frothingham (froth'ing-am), OCTAVIUS B., Unitarian theologian, born at Boston, Massachusetts, in 1822; died in 1895. He was ordained in 1847 and became pastor of the Third Unitarian Society in New York about 1859. He was a man of broad culture and excellent intellectual powers, and very radical in his views, resembling Theodore Parker in his radicalism. He wrote various works, including *Transcendentalism in New England*, *The Religion of Humanity*, *The Parables*, etc.

Froude (frōd), JAMES ANTHONY, historian and miscellaneous writer, born at Totness, Devonshire, in 1818. He was educated at Oxford, was elected fellow of Exeter College, and received deacon's orders. He resigned his fellowship and withdrew from the orders on the publication of his *Nemesis of Faith* (1848). Between the years 1856 and 1869 appeared his great work, *The History of England from the Fall of Wolsey to the Defeat of the Spanish Armada*, which was very popular, though it received but doubtful approval from historians. He was for some time editor of *Fraser's Magazine*, to which he contributed many articles, as well as to other

periodicals. He was elected rector of St. Andrews University in 1869. He was made literary executor to Carlyle, and his *Life of Carlyle*, and *Carlyle's Reminiscences*, and *Letters and Memorials of Jane Welsh Carlyle*, as edited by him, provoked an extraordinary amount of controversy. He died in 1894.

Fructidor (fruk'ti-dôr), the twelfth month of the French republican calendar (dating from September 22, 1792), beginning August 18, and ending September 16th.

Fruit (frōt), in botany, the seed of a plant, or the mature ovary, composed essentially of two parts, the pericarp and the seed. In a more general sense the term is applied to the edible succulent products of certain plants, generally covering and including their seeds. The hardier sorts of fruits indigenous to the United States, or which have been cultivated to any important extent there, are the apple, pear, plum, cherry, apricot, peach, and nectarine; the gooseberry, currant (red, white, and black), raspberry, strawberry, mulberry. The more important fruits requiring a warm climate are the fig, date, grape, orange, lime, banana, tamarind, pomegranate, citron, breadfruit, olive, almond, melon, cocoanut, etc. Some fruits are of immense economic importance, either from supplying food to great numbers of people (dates) or from furnishing beverages in extensive use (as wine from the grape).

Fruitarians, the name applied to those persons who advocate a diet consisting solely of fruit and nuts. As fruits contain little protein, the nuts are necessary to a balanced ration. Compare *Vegetarianism.*

Fruit-pigeon, the name given to the pigeons of the genus *Carpophăgus*, birds of very brilliant plumage, occurring in India, the warmer parts of Australia, etc. They are so called because they feed entirely on fruit.

Frustum (frus'tum), in geometry, the part of a solid next the base, left by cutting off the top portion by a plane parallel to the base; or the part of any solid between two planes, which may be either parallel or inclined to each other, as the *frustum* of a cone, of a pyramid, or of a sphere, which latter is any part comprised between two parallel sections.

Fry (frī), ELIZABETH, philanthropist, the third daughter of John Gurney, of Earlham Hall, near Norwich, England, was born in 1780; died at Ramsgate in 1845. In her eighteenth year a sermon preached by William Savery, an American Quaker, at Norwich, had the effect of turning her attention to serious things, and making her adopt decided views on religious matters. About this time also she made the acquaintance of Joseph Fry, a London merchant and a strict Quaker, to whom she was married in 1800. In 1810 she became a preacher among the Friends. Having paid a visit to Newgate in 1813, she was so impressed by the scene of squalor, vice, and misery which she there witnessed that the amelioration of prison life became with her a fixed object. In 1817 she succeeded in establishing a ladies' committee for the reformation of female prisoners in Newgate, along with a school and manufactory in the prison, the results of which proved eminently satisfactory. These improvements were shortly afterwards introduced by her means into other prisons. In the pursuit of her philanthropic labors she made tours through various parts of the United Kingdom, and also visited France, Belgium, Germany, and Holland.

Frye (frī), WILLIAM P., Senator, was born at Lewiston, Maine, in 1831. He studied law, became attorney-general of Maine in 1867, and member of Congress in 1871. In 1881 he was elected to the Senate, and was a member of the Paris Peace Conference after the War of 1898. He was continuously reëlected and died in 1911.

Fuad Pasha (fö'ăd pâ-shâ'), MEHEMED, a Turkish statesman and man of letters, was born at Constantinople in 1814; died at Nice in 1869. His diplomatic career took him to London, Madrid, and St. Petersburg; he was four times minister of foreign affairs, and for five years grand vizier; and was the chief support of the reform party in the Turkish empire. He wrote poetry, political pamphlets, and a Turkish grammar, which has been translated into several languages.

Fuca (fö'kă), STRAIT OF. See *Juan de Fuca, Strait of.*

Fucaceæ (fū-kā'se-ē), a nat. order of dark-colored algæ, consisting of olive-colored inarticulate seaweeds, distinguished from the other algæ by their organs of reproduction, which consist of archegonia and antheridia, contained in common chambers or conceptacles united in club-shaped receptacles at the ends or margins of the fronds. Fucaceæ exist in all parts of the ocean, and, though all are probably occasionally attached, they may persist as floating masses, like the gulf-weed. *Macrocystis pyrifĕra* is said to have fronds of 500 to 1500 feet long. See *Fucus.*

Fu-chow (fō-chou). See *Foo-chow.*

Fuchsia (fū'schi-a; named after the discoverer Leonard *Fuchs*, a German botanist), a genus of beautiful flowering shrubs, natives of South America, Mexico, and New Zealand, nat. order Onagraceæ, characterized by having a funnel-shaped, colored, deciduous, four-parted calyx, sometimes with a very long tube; four petals set in the mouth of the calyx-tube and alternating with its segments; eight exserted stamens, and a long style with a capitate stigma. This is one of our most common decorative greenhouse plants, while the hardy varieties out of doors in the open border form an important feature with their drooping, elegant habit and their wonderful profusion of flowers.

Fucino, or CELANO (fō'chē-nō, chel-ä'nō; Latin, *Fucinus Lacus*), formerly a lake of Southern Italy, about 11 miles long and 5 miles broad, 2181 feet above sea-level in the province of Aquila in the Central Apennines. As the lake often rose and submerged the neighboring lands, the Emperor Claudius caused a tunnel to be constructed to carry off its surplus waters into the Garigliano. This vast work was soon allowed to fall into disrepair. Between 1852 and 1875, however, this work was repaired and enlarged by a company, and the lake has now been thoroughly drained, and 36,000 acres of rich arable land reclaimed.

Fucus (fū'kus), a genus of seaweeds, family Fucaceæ, comprising various common seaweeds which have a flat or compressed forked frond, sometimes containing air-vessels. Many of the species are exposed at low water; they form a considerable proportion of the seaweeds thrown upon some coasts, and are used for manure and for making kelp. Most contain iodine.

Fuel (fū'el), carbonaceous matter, which may be in the solid, the liquid, or the gaseous condition, and which, in combining with oxygen, gives rise to the phenomenon of heat, the heat being made use of for domestic, manufacturing, and other purposes. The essential heat-producing elements of a fuel are carbon and hydrogen, and the fuel is valued in the measure in which these two elements are present. Oxygen, nitrogen, sulphur and phosphorus occur incidentally in most fuels. The inorganic matter contained in a fuel constitutes the ash. Fuels may be conveniently divided into three classes: Solid, as coal, wood, peat, coke and charcoal. Petroleum in its various forms, vegetable and animal oils, and alcohol are the liquid fuels most in use. The chief gaseous fuels are coal gas, water gas, natural gas and producer gas. Among the solid fuels coal is by far the most important. The common division of coal is into anthracite and bituminous. Bituminous coal is again divided into: anthracite; cooking and furnace coals; gas coal; non-cooking, long-flame coal; lignite, or brown coal; cannel coal. Anthracitic coal differs little from anthracite, containing 90 to 93 per cent. of free carbon, whereas anthracite contains 98 per cent. American anthracite is a hard, dense coal, with a metallic lustre, and burns with a smokeless flame, giving an intense heat. Gas coal contains from 80 to 85 per cent. of carbon, and is rich in gas. Lignite is a coal intermediate between peat and bituminous coal, often showing a woody structure. Cannel coal is also a large gas-producing coal.

Wood long held sway as the principal source of heating, but is not now in common use except in remote country districts. Coke and charcoal, the products respectively of coal and wood, are also much in use as fuel.

The chemical examination of fuels includes the determination of (1) moisture, (2) ash, (3) coke, (4) volatile matter, (5) fixed carbon in coke, (6) sulphur, (7) chlorine, (8) phosphorus. Moisture is determined by noting the loss in weight when a small sample is heated at 100 degrees for about one hour. The ash is determined by heating a sample in a muffle furnace until all the combustible matter has been burned off. The ash, which generally contains silica, oxides of the alkaline earths, ferric oxide (which gives the ash a red color), sulphur, etc., is analyzed by the ordinary gravimetric methods. The determination of coke is very important on account of the conclusions concerning the nature of the coal which it permits to be drawn. It may be (1) pulverulent, (2) slightly fritted, (3) spongy and swelled, (4) compact. A compact coke is yielded by good coking coals, and is usually large in amount.

Liquid fuels are comprised under the head of petroleum and its products, as naphtha, gasoline, kerosine, tar and tar refuse, etc.; alcohol, and for special uses, chemical derivatives such as amyl-acetate. Crude petroleum consists of about 85 per cent. carbon and 15 per cent. hydrogen. It thus provides a very efficient fuel, easily regulated, quickly lighted or extinguished, insuring a steady, intense heat and perfect combustion. To obtain proper combustion of oil fuel, the oil must be converted into spray, which is done by a steam jet or atomizer. Within the last

few years alcohol has come prominently into notice as a source of heat. It has been shown that crude denatured alcohol as a fuel for use in internal combustion engines is of higher efficiency than the lighter petroleum oils.

Among gaseous fuels, ordinary illuminating gas holds a prominent place from its use in small engines and shop and domestic appliances. In many large manufactories producer gas is being extensively used, and there is a growing tendency to introduce it in all industries where high temperatures are required and where large quantities of coal are consumed. Its advantages are demonstrated in the easy regulation of combustion; economy in labor, fuel and heat; and the high temperature obtained. Producer gas is derived from the decomposition of water or steam in contact with incandescent carbon. The first chemical reaction obtained is the formation of carbon dioxide and the liberation of hydrogen; this is succeeded by the formation of carbon monoxide, a non-luminous gas, but one possessing high calorific power. A plant for manufacturing the gas consists of a producer, or furnace; a vaporizer, for absorbing the waste heat of the gas to make the steam needed; a cooling washer; and a purifier, to remove the tar. Oil gas is also used as a fuel; that is, gas made from crude oils.

Prepared fuels are made from coal in a powdered condition. The coal after being washed is mixed and ground with tar, pitch or other binding material in the proportion of about 90 parts of coal to 10 of the binder. The mixture is then melted and molded into blocks of a size easy to handle. Attention has been directed to the utilization of coal in the form of dust. The advantages claimed for the direct use of coal dust are: complete combustion and the consequent elimination of smoke, and the greater efficiency of the fuel; ability to use a cheap grade of coal; the enlargement of furnace capacity, and small labor cost. One of its disadvantages is that ash dust is discharged into the air in large quantities. Only the bituminous coals have been successfully used alone.

Fuente (fo͞o-en'tā), with affixes, the name of numerous small towns in Spain. The most important is FUENTE-DEL-MAESTE, a town, province of Badajoz, near the right bank of the Guadajira, 82 miles S.S.E. of Badajoz. Pop. 6928.

Fuero (fo͞o-ā'rō), a Spanish word signifying jurisdiction, law, privilege, and applied historically to the written charters of particular districts, towns, etc. In 1833 a civil war broke out in the Basque provinces, in assertion of the fueros of that district, which lasted ten years, and was only pacified by the formal recognition of the Basque privileges in 1844 by the queen and cortes of Spain. The Basque fueros, however, were finally abrogated in 1876 as a result of the Carlist rising.

Fuerteventura (fwār-ta-vān-tō'ra), one of the Canary Islands, separated from Lancerota by the Strait of Bacayna. Cabras on the east coast has a good harbor. Area, 758 sq. m. Pop. about 11,669.

Fugger Family (fo͝g'gėr), THE, a distinguished German family, early admitted among the hereditary nobility, and now represented by two main lines of princes and several

Jakob von Fugger.

minor noble branches. The founder of this family was JOHANN FUGGER, a master-weaver who settled in Augsburg in 1368 and acquired much property. His descendants became leading bankers, merchants, and mine-owners, were liberal and public-spirited men, patrons of art, and several of them became distinguished soldiers and statesmen. Among the most eminent of the family was JAKOB FUGGER (1459-1525), who carried on great commercial operations, advanced money to the Emperors Maximilian and Charles V, and by the former was raised to the rank of nobleman, being also imperial councilor under both. Charles V raised Jakob's two nephews, Raimund and Anton Fugger, to the dignity of counts. He also invested them with the estates of Kirchberg and Weissenhorn, which had been mortgaged to them, granted them a seat at the imperial diet, and letters giving them princely privileges. Subsequently the highest places

of the empire were held by the Fuggers, and princely families thought themselves honored by their alliance.

Fugitive Slave Law, a law for the return of fugitive slaves to their masters, was passed by the United States Congress in 1793, and a much more stringent one in 1850, making it a penal offense to aid a slave in his flight and requiring all persons called upon to assist in his capture. This law caused much hostile feeling in the Northern states, few Northerners would obey its requirements, and it was one of the leading causes that brought on the Civil war.

Fugue (fūg), a musical term derived from the Latin word *fuga* (a flight), and signifying a polyphonic composition constructed on one or more short subjects or themes, which are harmonized according to the laws of counterpoint, and introduced from time to time with various contrapuntal devices, the interest in these frequently-heard themes being sustained by diminishing the interval of time at which they follow each other, and monotony being avoided by the occasional use of episodes, or passages open to free treatment.

Fuhnen. See *Funen.*

Fuji-Yama (fö'je-yä'ma), or FUSI-YAMA, a dormant volcano of a symmetrical, cone-like shape, in the island of Hondo, Japan, the sacred mountain of the Japanese. It has been quiescent since 1707; is 12,400 feet in height, and is visible in clear weather for a distance of nearly a hundred miles.

Fula, FULBE. See *Fellatah.*

Fulcrum (ful'krum), in mechanics, the support of fixed point about which a lever turns. See *Lever.*

Fulda (föl'da), a Prussian town, province of Hessen-Nassau, on a river of the same name, 54 miles S. S. E. of Cassel. It is irregularly built; contains a cathedral, a handsome modern edifice; a castle, once occupied by the prince bishops, and other interesting buildings; and has manufactures of cotton, woolen, and linen goods, etc. The town derives its origin from a once-celebrated abbey founded by St. Boniface (Winfried), the apostle of Germany, in 744. Pop. 16,900.

Fulgora (ful'gu-ra), the generic name of the lantern-flies (which see).

Fulgurite (ful'gū-rīt), any rocky substance which has been fused or vitrified by lightning. More strictly, a vitrified tube of sand formed by the intense heat of lightning when it penetrates a mass of sand, and fuses a portion of the materials through which it passes.

Fulham (fụl'am), one of the London parliamentary boroughs, bounded by the Thames and the boroughs of Chelsea, Kensington, and Hammersmith. It contains the palace of the Bishop of London. Pop. (1911) 153,325.

Fulica (fū'li-ka). See *Coot.*

Fuller (fụl-ler), MARGARET. See *Ossoli (Margaret Fuller).*

Fuller, MELVILLE WESTON, an eminent American jurist, was born in Augusta, Maine, 1833; graduated at Bowdoin College, 1853, and at Harvard Law School, 1855. After practising in his native town for a little over a year, he moved to Chicago, where he was very successful, and until 1880 took an active part in politics. In 1888 President Cleveland appointed him chief justice of the United States Supreme Court, a position held by him till his death in 1910.

Fuller, THOMAS, an eminent historian and divine of the Church of England, born in 1608 at Aldwinkle, in Northamptonshire; died in 1661. He graduated at Queen's College, Cambridge, held several clerical positions, and in 1643 joined the king at Oxford during the civil war. Becoming chaplain to Sir Ralph Hopton, of the army, he began the collection of materials relating to English history and antiquities. At the close of the war he took refuge in Exeter, and was appointed chaplain to the infant Princess Henrietta Maria. Shortly before the restoration he was reinstated in his prebendal stall, and soon after that event was made one of the king's chaplains. Several of his writings are English classics, remarkable for quaintness of style, wit, sagacity, and learning. Among the more important are: *History of the Holy War; The Holy and Profane State; Pisgah Sight of Palestine; Church History of Britain;* and the *Worthies of England*, a production valuable alike for the solid information it affords relative to the provincial history of the country and for the profusion of biographical anecdote and acute observation on men and manners.

Fuller's Earth (fụl'erz), a variety of clay or marl, compact but friable, unctuous to the touch, and of various colors, usually with a shade of green. It is useful in scouring and cleansing cloth, as it imbibes the grease and oil used in preparing wool. It consists of silica 50 per cent., alumina

20, water 24, and small quantities of magnesia, lime, and peroxide of iron. There are extensive beds of this earth in England and elsewhere.

Fulling-mill (ful'ing), a mill for fulling cloth by means of pestles or stampers, which beat and press it to a close or compact state, and cleanse it. The principal parts of a fulling-mill are the wheel, with its trundle, which gives motion to the tree or spindle, whose teeth communicate that motion to the pestles or stampers, which fall into troughs, wherein the cloth is put, with fuller's-earth, to be scoured and thickened by this process of beating.

Fulmar (fōl'mar), a natatorial or swimming oceanic bird (*Fulmārus glaciālis*) of the family Procellariidæ or petrels, about the size of a large duck. It inhabits the northern seas in prodigious numbers, breeding in

Fulmar (*Fulmārus glaciālis*).

Iceland, Greenland, Spitzbergen, the Shetland and Orkney Islands, the Hebrides, etc. It feeds on fish, the blubber of whales, and any fat, putrid, floating substance that comes in its way. It makes its nest on sea-cliffs, in which it lays only one egg. The natives of St. Kilda value the eggs above those of any other bird. The fulmar is also valued for its feathers and down, and for the oil found in its stomach, which is one of the principal products of St. Kilda. When caught or assailed it lightens itself by disgorging the oil from its stomach. There is another and larger species found in the Pacific Ocean.

Fulmination (ful-mi-nā'shun), a term used in chemistry to denote the sudden decomposition of a body by heat or percussion, accompanied by a flash of light and a loud report. Fulminating compounds, or fulminates, are explosive compounds of fulminic acid with various bases, such as gold, mercury, platinum, and silver. The old fulminating powder is a mixture of sulphur, niter, and potash. Fulminate of mercury forms the priming of percussion caps.

Fulminic Acid (ful-min'ik), a peculiar acid, known only in combination with certain bases, and first discovered along with mercury and silver, forming detonating compounds.

Fulton (ful'tun), a city, capital of Calloway County, Missouri, 26 miles N. E. of Jefferson City. Coal is extensively mined, and there are valuable mineral springs in the vicinity. There is a large fire-brick factory. Here is a State Insane Hospital, a School for the Deaf, and several colleges. Pop. 5228.

Fulton, a village of Oswego County, New York, 24 miles N. W. of Syracuse. It has flour, woolen, pulp, and paper mills, machine shops, gunworks, knifeworks, etc. Pop. 10,480.

Fulton, ROBERT, the inventor of the first practicable steamboat, was born in Lancaster County, Pennsylvania, in 1765; died 1815. He adopted the profession of portrait and landscape painter, and in his twenty-second year proceeded to England for the purpose of studying art under West. There he became acquainted with the Duke of Bridgewater, Earl Stanhope, and James Watt, and was led to devote himself to mechanical engineering. In 1794 he took a patent for a double-inclined plane, which was intended to supersede locks on canals; and he also patented a mill for sawing marble, machines for spinning flax and making ropes, a dredging-machine, etc. In 1797 he went to Paris, where he produced the first panorama that was exhibited there. He also, after some trials, was successful in introducing a boat propelled by steam upon the Seine. During a visit to Scotland he had seen and obtained drawings of the *Charlotte Dundas*, a steam-vessel which had plied with success on the Forth and Clyde Canal. His chief occupation in Paris, however, was the invention of torpedoes for naval warfare. He returned to America in 1806, and built a steamboat of considerable dimensions, which began to navigate the Hudson River in 1807. Its progress through the water was at the rate of 5 miles an hour. It was a considerable improvement over previous efforts at steam navigation and the steamboat was soon common on the rivers of the United States. In 1814 he constructed the first war steamship, and was engaged upon an improvement of his submarine torpedo when he died.

Fumage (fū'maj; Lat. *f u m u s*, smoke), a tax on every house with a chimney, mentioned in Domesday Book, and commonly called smoke-farthings. It is supposed to have been the origin of the *hearth-money* im-

posed by Charles II, and repealed by William and Mary.

Fumaria (fū'ma-ri-a). See *Fumitory*.

Fumariaceæ (fū-ma-ri-ā'se-ē), a small nat. order of exogenous plants, closely allied to Papaveraceæ. The species are slender stemmed, herbaceous plants, generally erect, though some climb by means of their twisting leaf-stalks. Many species are objects of cultivation by the gardener for the sake of their showy flowers. All are astringent and acrid plants, and are reputed diaphoretics and aperients. They inhabit the temperate and warm regions of the northern hemisphere and South Africa.

Fumigation (fū-mi-gā'shun), the application of fumes, gas, or vapor for the purpose of disinfecting houses, clothes, and the like. The fumes of heated vinegar, burning sulphur, or the like, formerly employed, are of but little value. For really active processes see *Disinfectants*.

Fumitory (fū'mi-tu-ri), the common name of *Fumaria*, a genus of plants, nat. order Fumariaceæ. Several species are known, natives of Europe, Aisa, and America. The common fumitory is a very frequent weed in our cornfields, and also found in highly-cultivated gardens. They are slender annual herbs with much-divided leaves and purplish flowers in racemes at the top of the stem or opposite the leaves. *F. officinālis*, the best-known species, was at one time much used in medicine for scorbutic affections, etc., but its use is now discontinued.

Funaria (fū-nā'ri-a), a genus of mosses, one of which, *F. hygrometrica*, is common in Britain, especially on spots where a wood-fire has been, and grows in all parts of the world.

Funchal (fun-shāl'), the capital of the Island of Madeira, situated on a bay on the south coast. It stretches for nearly a mile along the shore, and presents a thoroughly European appearance. It is a coaling station for steamers, and is much resorted to by invalids afflicted with pulmonary complaints. Pop. 20,850.

Function (funk'shun), in mathematics, a quantity so connected with another that no change can be made in the latter without producing a corresponding change in the former, in which case the dependent quantity is said to be a *function* of the other; thus, the circumference of a circle is a *function* of the diameter; the area of a triangle is a function of any two of the sides and the angle they contain. In order to indicate in a general way that one quantity y is a function of another x the notation $y = f(x)$, or something similar, is adopted; thus, if u be the area of a triangle, x and y two of the sides, and θ the contained angle, we should write $u = \phi(x, y, \theta)$.

Function, the specific office or action which any organ or system of organs is fitted to perform in the animal or vegetable economy.—*Vital functions*, functions immediately necessary to life, as those of the brain, heart, lungs, etc.—*Natural* or *vegetative* functions, functions less instantly necessary to life, as digestion, absorption, assimilation, expulsion, etc.—*Animal functions*, those which relate to the external world, as the senses, voluntary motions, etc.

Fundamental Note (fun-da-men'tal), in music, the lowest or gravest note that a string or pipe can sound.—*Fundamental tones* are the tones from which harmonics are generated.

Fundi, Fun-dungi (fun'dung'gi), a kind of grain allied to millet (the *Paspălum exile*), much cultivated in the west of Africa. It is light and nutritious, and has been recommended for cultivation in Britain as food for invalids especially.

Funds, Public, and Funded Debt, money lent to government constituting a national debt. The several debts contracted by the United States have been for war expenditure. In 1860, at the outbreak of the Civil war, our national debt was stated at $64,842,287. In 1866 it reached the enormous figures of $2,773,236,173. The money was borrowed at varying rates of interest, and a very large portion of the debt consisted of legal tender notes and other obligations bearing no interest. The debt was created rapidly, but its reduction excited the admiration of the world; in several instances $100,000,000 being paid in a single year. It is now reduced within easily manageable limits, amounting, less cash in the treasury, to about $1,000,000,000.

Fundy (fun'di), Bay of, a large inlet of the Atlantic, on the east coast of North America, separating Nova Scotia from New Brunswick. At its inner extremity it divides into Chignecto Bay, and Minas Channel and Basin, with smaller continuations. It is noted for its impetuous tides, which cause a rise and fall of from 12 to 70 feet, and the navigation is dangerous. At its entrance are Grand Manan and other islands. A ship-railway is being constructed

to connect Chignecto Bay with Northumberland Strait.

Funen (fū'nen; Danish, *Fyen*), the largest of the Danish islands except Seeland, from which it is separated by the Great Belt, and from Jutland by the Little Belt; circuit, about 185 miles; area, 1132 square miles. The interior towards the west is covered by a range of low hills, but, with this exception, it is composed of large and fertile plains under good cultivation. The largest stream is the Odense, which has a course of about 36 miles. The chief towns are Odense, Svendborg, and Nyborg. Pop. with Langeland and Arroe, 240,359.

Funeral Rites (fūn'er-al rīts), the rites and ceremonies connected with the disposing of the dead. Among the ancient Egyptians the friends of the deceased put on mourning habits, and abstained from gayety and entertainments for from forty to seventy days, during which time the body was embalmed. Among the ancient Jews great regard was paid to a due performance of the rites of sepulture; and among the ancient Greeks and Romans to be deprived of the proper rites was considered the greatest misfortune that could happen. The decorous interring of the dead with religious ceremonies indicative of hopes of a resurrection is characteristic of all Christian nations. With Roman Catholics the body is the object of solemn ceremonial from the moment of death until interment. The Church of England funeral service is too well known to require any notice. Among other Protestant bodies there is usually no formal service, but prayer is offered up or an ordinary religious service held before the interment in the house of the deceased or his relatives, or, in the case of a public funeral, in some public place. The practice of delivering funeral orations at the interment of the dead by laymen is common in France, and not unfrequent in America. In Ireland the wake, or watching of the dead, by the lower classes, is usually a scene of tumult and drunkenness. For many curious customs at funerals see Brand's *Popular Antiquities* and Strutt's *Manners and Customs;* see also *Burial.*

Fünfkirchen (fünf'kirh-ĕn; 'Five Churches'), a town of the Austrian Empire, in Hungary, on the slope of a hill, 105 miles s. s. w. Budapest. It is the see of a bishop, and the cathedral, a handsome Gothic structure, is one of the oldest ecclesiastical edifices in Hungary. Fünfkirchen once had a flourishing university, attended by 2000 students. Its industries comprise fine pottery, woolens, leather, liqueurs, etc. In the neighborhood brown coal and black marble are worked. Pop. (1911) 49,822.

Fungi (fun'ji), a large natural order of cryptogamous or flowerless plants, comprehending not only the various races of mushrooms, toadstools, and similar plants, but a large number of microscopical plants growing upon other plants, and substances which are known as molds, mildew, smut, rust, brand, dry-rot, bacteria, etc. Fungi agree with algæ and lichens in their cellular structure, which is, with very few exceptions, void of anything resembling vascular tissue; but differ from them in deriving their nutriment from the body on which they grow, not from the medium by which they are surrounded. They are among the lowest forms of vegetable life, and, from the readiness with which they spring up in certain conditions, their germs are supposed to be floating in the atmosphere in incalculable numbers. Many diseases are produced by fungi. Fungi differ from other plants in being nitrogenous in composition, and in inhaling oxygen and giving out carbonic acid gas, in these respects approximating to the similar animal functions. Berkeley divides fungi into two great sections, the first having the spores naked, and comprising agarics, boleti, puffballs, rust, smut, and mildew; the second, comprising the morels, truffles, certain molds, etc., in which the spores are in sacs (*asci*). These are again subdivided into six principal orders, all formed on the mode in which the spores are borne, namely:—1. *Ascomycetes*, comprising a vast number of the black pustular growths abundant on dead wood, bark, twigs, leaves, etc. Among these are the mildews (*Erysiphe*), the black mildews (*Capnodium*), and the whole great tribe of *Sphæriæ*. The truffles (*Tuber*), morels (*Morchella*), and *Helvellæ* also belong to this division. 2. *Physomycetes*, a small group comprising the true molds. 3. *Hyphomycetes*, including the bacteria of disease and the great host of minute molds which cover almost every substance exposed to dampness. To it also belong the mold of the potato-rot (*Botrytis infestans*) and many which induce decay in fruit (*Oïdium*), the bread and cheese molds (*Penicillium, Aspergillus*), and the yeast and vinegar plants, which are submerged mycelia of *Penicillium*. 4. *Coniomycetes*, comprehending the whole family of rusts, smuts, and bunt (*Puccinea, Urĕdo, Ustilāgo, Tilletia, Æcidium*, etc.). 5. *Gasteromycetes*, including the whole tribe of puffballs, as well as the subterranean fungi which look

like truffles, but are dusty and smutty within. 6. *Hymenomycetes*, typical and well-known examples of which are found in the mushrooms and sapballs. Fungi occur in every part of the earth where the cold is not too intense to destroy the spawn, though they abound most in moist, temperate regions where the summer is warm. Several species afford excellent and abundant food, others are valuable in medicine, while many are deadly poisons and many, plant pests.

Fungicides (fun'ji-sīdz), substances used to prevent or destroy fungous growths on plants. The marked extension of injurious parasitic growths has attracted wide attention to the subject of fungicides, and the United States Department of Agriculture, has issued bulletins on fungicides.

Funnel (fun'el), the shaft or hollow channel of a chimney through which smoke ascends; especially in *steamships*, a cylindrical iron chimney for the boiler-furnaces rising above the deck.

Funston (funs'ton), FREDERICK, soldier, was born in Ohio in 1865. In 1898 he joined the army of the Philippines. His most famous exploit was the capture of Aguinaldo, the Philippine leader. In 1916, as major-general, he commanded the forces on the Mexican border. He died February 19, 1917.

Fur. Fur is the fine, soft, hairy covering of certain animals. The term is sometimes distinctively applied to such coverings when prepared for being made into articles of dress, etc., while the name of peltry is given to them in an unprepared state or when merely dried. The animals chiefly sought after for the sake of their furs are the beaver, raccoon, muskrat, squirrel, hare, rabbit, chinchilla, bear (black, gray, and brown), otter, sea-otter, seal, wolf, wolverine or glutton, marten, ermine, lynx, coypou (nutria), polecat (fitch), opossum, fox, etc. (See under proper headings.) All the preparation that skins require before being sent to the market is to make them perfectly dry, so as to prevent them from putrefying. This is done by exposing them to the heat of the sun or a fire. The small skins are sometimes previously steeped in a solution of alum. When stored in large quantities they must be carefully preserved from dampness, as well as from moths. The fur-dresser, on receiving the skins, first subjects them to a softening process. He next cleans them from loose pieces of the integument by scraping them with an iron blade. Finally, the fur is cleaned and combed, after which it is handed over to the cutter, who cuts the furs out into the various shapes required to make the different articles desired.

Fur Trade. In Europe the fur trade is fed chiefly by Russia, which yields great quantities of furs, especially in the Asiatic portions of her dominions. Austria, Turkey, Scandinavia, etc., also yield a certain quantity. The fur trade of America has long been highly important, and has given origin to several great trading companies, of which the Dutch East India Company was first. The French early took up the fur trade in Canada, and their chain of forts and trading posts at one time extended from Hudson Bay to New Orleans. Quebec and Montreal were at first trading posts. In 1670 Charles II granted to Prince Rupert and others a charter empowering them to trade exclusively with the aborigines of the Hudson Bay region. A company, then and after called the *Hudson Bay Company*, was formed, which for a period of nearly two centuries possessed a monopoly of the fur trade in the vast tract of country known as the Hudson Bay Territory. In the winter of 1783-84 another company was formed at Montreal, called the *Northwest Fur Company*, which disputed the right of the Hudson Bay Company, and actively opposed it. After a long and bitter rivalry the two companies united in 1821, retaining the name of Hudson Bay Company. The monopoly which had hitherto been enjoyed by the original company about Hudson Bay was now much extended; but in 1868 an act of parliament was passed to make provision for the surrender, upon certain terms, of all the territories belonging to the company, and for their incorporation with the Dominion of Canada. In 1869 the surrender was carried out, Canada paying £300,000 to the company by way of compensation. The company still possesses about 150 houses, forts, and posts in the whole region formerly belonging to it, and its operations, indeed, extend beyond British America into the United States and to the Sandwich Isles and Alaska. It employs directly somewhere about 3000 agents, traders, voyagers, and servants, besides Indian hunters. Some of its posts are situated very far north, almost approaching the Arctic Ocean. The trade in furs conducted by citizens of the United States has been extensive, but in a greater degree the result of individual enterprise than of the management of gigantic corporations. The Alaska Fur Company holds two of the Aleutian Islands in lease from the government with the sole right of killing yearly not more than 100,000 fur-seals. The fur trade centers in Lon-

don, this being the only place in which the fur is dyed.

Furca (fŏr'ka), FURCAHORN, an Alpine mountain in Switzerland, Canton Valais, immediately west of St. Gothard; height, 9935 feet, containing the glacier in which the Rhone has its source. The summit of the Furca Pass, over which there is a good road, is 7992 feet high.

Furies (fū'rēs), EUMENIDES, ERINNYES (among the Romans, *Furiæ* and *Diræ*), deities in the Greek mythology, who were the avengers of murder, perjury, and filial ingratitude. Later mythologists reckon three of them, and call them *Alecto*, *Megæra*, and *Tisiphone*. Æschylus, in his celebrated tragedy of the *Eumenides*, introduced fifty furies, and with them *Fear* and *Horror*, upon the stage. They were regarded with great dread, and the Athenians hardly dared to speak their names, but called them the *venerable goddesses*. It was by a similar euphemism the name Eumenides, signifying the soothed or well-pleased goddesses, was introduced. Erinnyes, the more ancient name, signifies the hunters or persecutors of the criminal, or the angry goddesses.

Furlong (fur'long; that is, 'furrow-length'), a measure of length, 40 rods, poles, or perches, equal to 220 yards, the eighth part of a mile.

Furlough (fėr'lō), a military term signifying leave of absence given by the commanding officer to an officer or soldier under his command.

Furnace (fur'nes), a device for the production and utilization of heat generated by the combustion of fuel or by the conversion of electrical energy. A furnace consists of three essential parts: the fireplace, where the fuel is consumed; the hearth, where the heat is applied; and the draft. The draft may be supplied by the use of a high chimney; but where this does not prove sufficient, forced draft by means of blowers, bellows, fans, or a steam jet acting as an injector, is used. The difference of efficiency between forced and natural draft has been estimated as being 25 per cent. in favor of the former. Regulating the supply of fuel is almost as important as regulating the supply of air, and to this end self-feeding furnaces have been devised. Furnaces are conveniently divided into three classes: (1) Those in which the fuel and the substance to be heated are in intimate contact, as in kilns and blast furnaces; (2) those in which the substance is heated by the products of combustion, as in reverberatory furnaces, of which the puddling furnace is a type; (3) those in which the substance is not directly heated by the products of combustion, as in crucible, muffle, and retort furnaces. Gas furnaces are now in common use, both on account of their cleanliness and the facility of regulating the heat. For very high temperatures the electric furnace is utilized. See *Electric Furnace*.

Furneaux Islands (fėr'nō), a group belonging to Tasmania, at the east end of Bass Strait, including Flinders Island with an area of 513,000 acres; Cape Barren Island, 110,000 acres; and Clarke Island, 20,000 acres. On the west the islands have steep, rocky shores, but on the east slope gradually down to a low, sandy beach, with numerous swamps and lagoons. The inhabitants, who are few in number, many of them 'half-castes,' procure a living by seal-fishing and preserving mutton-birds, a species of petrel. The islands are named after the officer who was second in command in Captain Cook's second voyage.

Furness (fur'nes), a district of N. W. Lancashire, England, forming part of what is called the Lake District. Furness Abbey is a noble ruin situated one mile S. of Dalton-in-Furness, comprising the church walls, chapter-house, refectory, and guest-hall, the whole giving evidence of the former magnificence of the structure. It was founded in 1127 by Stephen, afterwards King of England.

Furness, WILLIAM HENRY, a Unitarian clergyman, born at Boston, Massachusetts, in 1802; died in 1896. He graduated from the Harvard Divinity School in 1823, became pastor of the First Unitarian Church of Philadelphia in 1825, and held this charge until 1875, when he retired as pastor emeritus. He was a close friend of Emerson, Sumner, Garrison, and Lucretia Mott, and an earnest abolitionist. He wrote extensively, his favorite theme being the life and character of Christ. His son, WILLIAM HENRY, JR. (1828-67), studied art and achieved fame as a portrait painter. A second son, HORACE HOWARD, born in 1833, studied law and was admitted to the bar in 1859. He contributed largely to legal literature, but is best known as a Shakesperean critic and editor, his variorum edition of Shakespere, of which a number of volumes have been issued, being highly esteemed. He died in 1912.

Furnivall (fur'ni-val), FREDERICK JAMES, born at Egham, in Surrey, 1825; educated at University College, London, and Trinity Hall, Cambridge. He devoted his life chiefly to the study of early and middle English literature; and was mainly instrumental in

establishing the Early English Text Society, the Chaucer Society, the New Shakespere Society, the Browning Society, the Wickliffe Society, and the Shelley Society. He was the hon. secretary of the Philological Society. He edited numerous works, chiefly through the medium of some of these societies, notably the Six-Text edition of Chaucer's *Canterbury Tales*. He died in 1910.

Furruckabad. See *Farukhabad*.

Fur-seal, a name given to several of the Otariidæ or 'eared' seals which have a dense covering of fine underfur. The best known and most valuable is the fur-seal or sea-bear (*Callorhinus ursinus*) of some of the islands connected with Alaska, especially St. Paul's and St. George's, where it breeds. See *Seal*, *Fur*, and *Fur Trade*.

Fürst (fûrst), JULIUS, orientalist, born of Jewish parents at Zerkowo, Prussian Poland, 1805; died at Leipzig, 1873. He devoted himself to philological science, and early showed a marvelously extensive acquaintance with Rabbinical literature. He obtained an appointment as lecturer in the University of Leipzig in 1839, and in 1864 was promoted to the rank of professor. He was the author of numerous works all connected with oriental philology, chief among which are his *Concordantiæ Librorum Sacrorum Veteris Testamenti Hebraicæ et Chaldaicæ*, and his *Hebrew and Chaldee Lexicon*. From 1840 to 1851 he edited *Der Orient*, a journal devoted to Jewish language, literature, history, and antiquities.

Fürstenwalde (fûrst'en-vâl-dė), a town in Prussia, 30 miles E. S. E. of Berlin, on the right bank of the Spree. It has a brick church of the fourteenth century, and manufactures of woolen and linen cloth, hosiery, and leather. Pop. (1905) 20,498.

Fürth (fürt), a town in Bavaria, 6 miles W. N. W. of Nürnberg, at the confluence of the Pegnitz with the Rednitz. It has important and varied manufactures, including mirrors, picture-frames, jewelry, gold-leaf, lead pencils, spectacles, machinery, etc. A battle was fought in its neighborhood in 1632. Pop. (1910) 66,533.

Furze (furz), whin, gorse, the common name of the species of the genus *Ulex*, nat. order Leguminosæ. Twelve species have been described, of which the common furze (*U. Europæus*) is a low, shrubby plant, very hardy, and very abundant in barren, heathy, sandy, and gravelly soils throughout the west of Europe. The stem is generally 2 or 3 feet high, much branched and most of the leaves converted into spines. The flowers are solitary and yellow. It often covers exclusively large tracts of country, and makes a splendid appearance when in flower. It is used as fuel, and sometimes the tops of the branches are used (especially the young tops) as fodder for horses and cattle, after having been beaten or bruised to soften the prickles.

Fu-San (fö-sân), a town and treaty port of Corea, situated on a bay of the same name, on the southeast coast. It imports silk, cotton goods and metals, and exports raw silk, rice and hides. Pop. of district 16,797.

Fusaro (fö-sa'rō), LAKE OF, a small Italian lake on the Peninsula of Baiæ, 11 miles W. of Naples. It is supposed to have been the harbor of ancient Cumæ, and is still celebrated for its oysters.

Fuse (fūz), a tube filled with combustible matter, used in blasting, or in discharging hollow projectiles, etc. There are many varieties in use, such as the fuse used in mining and quarrying, which usually consists of a tube filled with a slow-burning composition, which gradually burns down to the charge; the *concussion* and *percussion fuses* for hollow projectiles, which explode the charge when an object is struck; the *electric fuse*, which is ignited by the passage of an electric spark through it; and *time* or *mechanical fuses*, used in some forms of torpedo, and with such explosives as dynamite and guncotton.

Fusee (fū-zē'), the cone or conical part of a watch or clock, round which is wound the chain or cord. It is a mechanical contrivance for equalizing the power of the mainspring; for as the action of a spring varies with its degree of tension, the power derived from

Barrel and Fusee of a Watch.

the force of a spring requires to be modified according to circumstances before it can become a proper substitute for a uniform power. In order, therefore, to correct this irregular action of the mainspring, the fusee on which the chain or catgut acts is made somewhat conical, so that its radius at every point may be adapted to the strength of the spring.

Fuseli (fū'se-li), JOHN HENRY (original name *Füssli* or *Fuessli*; fûs'lē), a painter, born in 1741 or 1742

at Zürich; died at London, and was buried in St. Paul's Cathedral, in 1825. He was educated for the church, but a political pamphlet written by him and Lavater led to his taking refuge in England in 1765, bent on a literary career. On the advice of Sir Joshua Reynolds he devoted himself to art, went to Italy and studied there for nearly nine years. He was elected a member of the Royal Academy, and made its keeper in 1804. Among his notable pictures are his contributions to Boydell's Shakespere Gallery, and forty-seven pictures from Milton. He had considerable literary gifts, and his lectures on painting are still esteemed.

Fusel-oil (fū'sel-oil), a heavy, oily, inflammable fluid with a high boiling-point, disagreeable, cutting odor, and pungent taste, which is separated in the rectification of ordinary spirit distilled from grain, malt, potatoes, molasses, beet-root, etc. The composition of this fluid depends on the materials used in the manufacture of the spirit, but it may be said to consist to a large extent of ethylic and amylic alcohol ($C_5H_{12}O$). Fusel-oil acts very deleteriously on the animal system, and this is the reason why inferior spirits are so injurious in their effects.

Fu-Shan. See *Foo-Shan.*

Fusibility (fū-sū-bil'i-ti). See *Fusing-point, Fusion.*

Fusible Metal (fūs'i-bl), an alloy, usually of lead, tin, and bismuth, compounded in such definite proportions as to melt at a given low temperature. In steam-engines, a plug of fusible metal is placed in the skin of the boiler, so as to melt and allow the steam to escape when a dangerous heat is reached.

Fusible Porcelain, a silicate of alumina and soda obtained from cryolite and sand, fused and worked as glass.

Fusiliers (fū-si-lērz'), formerly soldiers armed with a fusil or light flintlock musket closely resembling a carabine. The name is given to nine or ten regiments in the British army, which differ from other regiments of the line chiefly in the busby worn by officers and non-commissioned officers.

Fusing-point (fūz'ing), the degree of temperature at which a substance melts or liquefies. This point is very different for different metals. Thus potassium fuses at 136° Fahr., bismuth at 504°, lead at 619°, zinc at 680°, silver 1832.° gold 2282°. Malleable iron requires the highest heat of a smith's forge (2912°); while cerium, platinum, and some other metals are infusible in the heat of a smith's forge, but are fusible in the flame produced by the oxyhydrogen blowpipe.

Fusion (fū'zhun), the conversion of a solid body into the liquid state by direct heat, as distinguished from solution, in which the effect is produced by means of a liquid. It is difficult, however, to draw a line between the two, for the main difference is in the temperature, and when a flux is employed all distinction disappears. The term is specially applied to the action of heat on the metals, but it is extended to any solid matter; thus the passage of ice into water at 32° F. is true fusion. There are bodies like carbon, lime, magnesia, zirconia, and other metallic oxides which are practically, if not absolutely, infusible. See *Fusing-point.*

Fusi-Yama (fö-zē-a'ma.) See *Fuji-Yama.*

Fust, JOHANN, a goldsmith of Mainz, associated with Gutenberg and Schöffer in connection with the origin of printing. He probably died of the plague in 1466. See *Printing.*

Fustian (fust'yan), a cotton or mixed linen and cotton fabric with a pile like that of velvet but shorter. It includes corduroy, moleskin, velveteen, etc.

Fustic (fust'ik), the wood of the *Maclura tinctoria*, a tree of the mulberry order growing in the West Indies. It is a large and handsome tree, and the timber, though, like most other dyewoods, brittle, or at least easily splintered, is hard and strong. It is extensively used as an ingredient in the dyeing of yellow, and is largely imported for that purpose.—*Young fustic* is the wood of the *Rhus cotinus* or Venice sumach, a South European shrub with smooth leaves and a remarkable feathery inflorescence. It yields a fine orange color, which, however, is not durable without a mordant.

Fusus (fū'sus), a genus of gasteropodous molluscs nearly allied to *Murex*, with a somewhat spindle-shaped univalve shell. The genus comprises many species. They are distributed over the whole world, living generally on muddy and sandy sea-bottoms.

Futehpur. See *Fatehpur.*

Futhork (fu'thork), the name given to the earliest or runic alphabet in use among the Teutonic and Gothic nations of northern Europe, so called from its first six letters, f, u, th, o, r, k. See *Runes.*

Futtipur Sikra. See *Fatehpur Sikri.*

Futtygurh. See *Fategarh.*

Futurist (fū'tūr-ist), in general, one who has regard to the future. The name is applied to a modern school of painting which aims at the delineation of impression rather than of observation. The futurist seeks to convey to the canvas a pictorial representations, not of the object, but of his own feelings upon regarding the object. The work of the futurists, like that of the cubists, has attracted wide attention in Europe. It became generally familiar to the American public through the International Exhibition of Art held in New York in 1913.

Fyne (fīn), Loch, an arm of the sea in Scotland, in the county of Argyle, running northwards from the Firth of Clyde for about 40 miles. Its depth varies from 12 to 50 fathoms. It is particularly celebrated for its herrings.

Fyrd (fûrd), in Anglo-Saxon England the military array or land force of the whole nation, comprising all males able to bear arms. The array of the fyrd of each shire was left to the ealdorman.

Fyt (fīt), John, a Dutch painter and etcher, born at Antwerp in 1611; died there in 1661. His subjects were chiefly game, hunting pieces, dogs, fruit, flowers, etc.

Fyzabad, or Faizabad (fī-zä-bäd'), a town of British India, in what was formerly the kingdom of Oude, on the Gogra, 78 miles E. from Lucknow. It was the scene of one of the outbreaks in the Indian rebellion of 1857. Pop. including cantonments, 75,085.

G

G, the seventh letter in the English alphabet. English *g hard* is a guttural mute, the 'voiced' or soft or sonant sound corresponding to the 'breathed' or hard or surd sound *k* (or *c* hard). This sound of *g* is what the letter always has before *a* (except in *gaol*), *o*, *u*, and when initial also before *e* and *i* in all words of English origin, and when final. The *soft* sound of *g*, or that which it more commonly has before *e*, *i*, and *y*, as in *gem*, *gin*, *gymnastics*, is a palatal sound the same as that of *j*, and did not occur in the oldest English or Anglo-Saxon.

G, in music, (*a*) the fifth note, and dominant of the normal scale of C, called also *sol;* (*b*) the lowest note of the grave hexachord; in the Guidonian system *gamma ut;* (*c*) a name of the treble clef, which is seated on the G or second line of the treble staff, and which formerly had the form of G.

Gabbro (gab'rō), the name given by the Italians to a rock consisting essentially of diallage and white epidote or saussurite. It is used for ornamental purposes in building, for table-tops, etc.

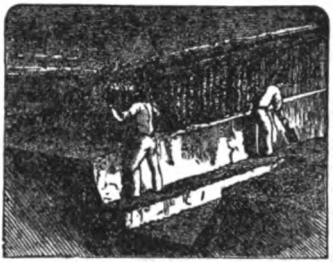
Gabbronite (gab'ru-nīt), GABBONITE, a mineral, a variety of scapolite, occurring in masses whose structure is more or less foliated or sometimes compact. Its colors are gray, bluish or greenish gray, and sometimes red.

Gabelle (gā-bel), a name originally given in France to every kind of indirect tax, as on wine, cloth, etc., but at a later period specially applied to the tax upon salt, which after being frequently imposed as a temporary means of raising money, became under Charles V a permanent impost. Under Henry II nine provinces and three counties purchased perpetual exemption from the tax, but it was not finally suppressed in France, by the Constituent Assembly, until 1790. About that time, out of 38,000,000 livres raised by farmers-general from this tax, 7,000,000 at most came into the treasury.

Gabes. Same as *Cabes*.

Gabilla (gā-bēl'yā), a finger or parcel of tobacco in Cuba. Thirty-six to forty leaves make a *gabilla*, *4 gabillas 1 hand*, *80 hands 1 bale*.

Gabion (gā'bi-un), a large wickerwork basket of cylindrical form, but without bottom. In a siege, when forming a trench, a row of gabions is placed on the outside nearest the fortress, and filled with earth as it is thrown



Part of Trench with Gabions and Fascines.

from the trench, so as to form a protection against the fire of the besieged. Each gabion is about 20 inches in diameter and 33 inches in height, but this height is usually increased by placing a row of fascines on the top after the interior has been filled up.

Gable (gā'bl), the triangular end of a house or other building, from the eaves to the top, and distinguished from a pediment by this, among things, that it has no cornices.

Gaboon (ga-bōn'), THE, or M'PONGO, an estuary on the west coast of Africa, opening from the Gulf of Guinea immediately north of the equator. Several rivers discharge themselves into it. The Gaboon territory forms part of the French Congo territory. The chief tribes are the Mpongwa or Gabonese, and the Fans, who carry on an active trade with Europeans in ivory, copal, ebony, dyewoods, etc. The vast swamps render the climate unhealthy, but inland rise some considerable hills with dense

jungle-like woods, the abode of the gorilla. The chief station is Libreville. There are several English trading-posts along the estuary (Glass Town, Olemi, etc.), and mission stations of several nations.

Gaboriau (ga-bo-rē-ō), Emile, a French novelist, born in 1834; died in Paris in 1873. After contributing to the smaller Parisian journals short sketches published under the titles *Ruses d'Amour*, *Les Comédiennes Adorées*, etc., he achieved a considerable success by his novel *Dossier No. 113* (1866). He continued to work this vein in a series of clever stories dealing with crime and its detection: *Le Crime d'Orcival*, *L'Affaire Lerouge*, *Les Esclaves de Paris*, *La Vie Infernale*, *La Corde au Cou*, *L'Argent des Autres*, etc.

Gabriel (gā'bri-el; 'hero or man of God'), according to Biblical history, the angel who announced to Zacharias the birth of John, and to Mary the birth of the Saviour. In Jewish mythology he is one of the seven archangels. The rabbins say he is the angel of death for the Israelites, and according to the Talmud he is a prince of fire, who presides over thunder and the ripening of fruits. In Mohammedan theology he is one of the four angels employed in writing the divine decrees, and the angel of revelation, in which capacity he dictated the Koran to Mohammed.

Gad (gad; 'a troop'), one of the twelve tribes of Israel, which took its name from Gad, the son of Jacob and Zillah. At the time of the exodus the tribe numbered 45,650 men of twenty years old and upwards; and as being a pastoral tribe they were assigned a rich district in Gilead between Reuben and Mannasseh. See Josh. xiii, 24-28.

Gadames. See *Ghadames*.

Gadara (gad'a-ra), an ancient city of Syria, in the Decapolis, about 6 miles S. E. of the Sea of Galilee. It played an important part in the struggles against Antiochus, Alexander Jannæus, and Vespasian, and only fell into decay after the Mohammedan conquest of Syria.

Gaddi (gad'ē). (1) Gaddo, a Florentine worker in mosaic and founder of the modern mosaic art, born 1249; died 1312.—(2) Taddeo, an artist, son of preceding, born 1300; died 1360. His works are among the best examples of fourteenth-century art, his decorations of the Church of Santa Maria Novella at Florence being specially noteworthy. —(3) Agnolo, son of Taddeo, born 1324; died 1390. His style was compounded from his father and Giotto, and he has been called the founder of the Venetian school.

Gade (gä'de), Niels Wilhelm, one of the leading Scandinavian composers, born in 1817 at Copenhagen, where, in 1841, by his overture entitled *Echoes of Ossian*, he gained the prize of the Musical Union. He was supported during his studies abroad by a royal stipend, and in 1844 was appointed to succeed Mendelssohn in the direction of the Gewandhaus concerts at Leipzig. In 1850 he was appointed musical director to the King of Denmark, and in 1876 received a life pension. His works, which are Mendelssohnian in character, include seven symphonies, several overtures, sonatas, quintets, etc.; a lyrical drama —*Comala;* a religious cantata—*The Crusaders;* an opera—*The Nibelungen;* etc.

Gades, the ancient name of Cadiz.

Gadfly (gad'flī), a name commonly applied to various insects, a large number of which belong to the great Linnæan genus *Œstrus*, while others belong to the genus *Tabănus*. *Œ. bovis* or ox gadfly (the *Hypoderma bovis* of some naturalists) is about 7 lines in length; thorax yellow, with a black band; abdomen white; terminal segments fulvous; wings dusky. This species attacks the horse also, the female depositing her eggs in the skin of these animals in considerable numbers. In a short time the eggs are matured, and produce a *larva* or worm, which immediately pierces the skin, raising large lumps or tumors filled with pus, upon which the larva feeds. *Œ. equi* (the *Gastrophilus* or *Gastrus equi* of some naturalists) deposits its eggs upon such parts of the skin of horses as are subject to be much licked by the animal, and thus they are conveyed to the stomach, where the heat speedily hatches the larvæ, too well known under the name of *botts*. *Œ. ovis* (also called *Cephalomyia ovis*) deposits its eggs in the nostrils of sheep, where the larva is hatched, and immediately ascends into the frontal sinuses, attaching itself very firmly to the lining membrane by means of two strong hooks situated at its mouth. Other species infest the buffalo, camel, stag, etc. Even rhinoceroses and elephants are said not to be altogether exempt from their attacks. The characteristics of the genus *Tabănus* are two enormous eyes, usually of a greenish-yellow color rayed or spotted with purple antennæ scarcely longer than the head, the last joint with five divisions. These insects suck the blood of horned cattle, horses, and sometimes

even of men. Cattle exhibit great alarm and excitement at the presence of the gadfly, and rush wildly about, with head stretched forward and tail stuck out, to escape from their tormentor. These pests are common in the different sections of the United States.

Gadidæ (gad'i-dē), a family of malacopterous fishes, which includes the cod, ling, haddock, etc. See *Cod.*

Gadolinite (gad'o-lin-īt), a mineral, a silicate of yttrium, with considerable proportion of lime and magnesia, of the oxides of iron, cerium, lanthanum, glucinum, and of other bases.

Gadsden (gadz'den), a town, capital of Etowah County, Alabama, on the Coosa River, 63 miles N. W. of Birmingham. It has blast furnaces, carworks, cottonseed oil and saw mills, etc., and a large trade in lumber, cotton, and grain. There are iron and coal fields in its vicinity. Pop. 10,557.

Gadsden Purchase (g a d z'den), a tract of land in Southern New Mexico and Arizona, acquired from Mexico in 1853 by treaty negotiated by Gen. James Gadsden. The purpose of this purchase was a proper adjustment of the southern border line of the two territories, the United States paying Mexico $10,000,000 for the new area of 45,535 square miles acquired.

Gadwall (gad'wal), the common name of *Anas strepera*, a species of duck not so large as the mallard, with long, pointed wings and a vigorous and rapid flight. North America as far down as South Carolina is its favorite habitat. It visits Europe but is rare in Great Britain.

Gaedhelic (gā'el-ik). See *Gael.*

Gaekwar, or GAIKWAR (gīk-wär'). See *Baroda.*

Gael (gāl), the name of a branch of the Celts inhabiting the Highlands of Scotland, Ireland, and the Isle of Man. Gadhel or Gael is the only name by which those who speak the Gaelic language are known to themselves. By way of distinction the Highlanders of Scotland call themselves Gael Albinnich (Gaels of Albin) and the Celtic population of Ireland call themselves Gael Erinnich (Gaels of Erin).

Gaelic, is a linguistic title now generally restricted to that dialect of the Celtic language which is spoken in the Highlands of Scotland, and hence distinguished from Manx and Irish, the other two kindred dialects, which scholars of the present day include under the name (or rather spelling) Gaedhelic. The modern Gaelic differs to some extent from the Irish in pronunciation, in grammar, in idioms, and in vocabulary. The literature of the Gaelic language is somewhat scanty, and is much less ancient and important than the Irish. The earliest written specimens of Gaelic are scraps contained in the *Book of Decr*, a religious manual belonging to the early part of the twelfth century. To the fourteenth and fifteenth centuries a considerable number of pieces belong. A collection of the older poetry, ascribed to Ossian and others, was made in the first half of the sixteenth century by Sir James Macgregor, dean of Lismore—hence called 'The Dean of Lismore's Book.' Robert Calder Mackay, or Robb Donn, and Duncan Ban McIntyre, of Glenorchy, are the two most noteworthy poets among the Scottish Highlanders in modern times. They both belong to the eighteenth century. This century also saw the publication of the Bible in Gaelic, the Irish Bible having been previously well known in the Highlands. The so-called poems of *Ossian* appeared about the same time, but in English, and it was not till 1818 that the corresponding Gaelic text appeared. A series of tales and legends of the Highlands of Scotland have been collected and published by J. F. Campbell. Various English works have been translated into Gaelic, and several collections of Gaelic poetry have been published in the present century, as well as Gaelic periodicals. Gaelic poetry still continues to be written not only in Scotland but even in America.

Gaëta (gä-ā'tä; anciently *Caieta*), a strongly fortified seaport town of S. Italy, province of Terra di Lavoro, on the Gulf of Gaëta, the seat of a bishop, 45 miles northwest of Naples. It is a place of great antiquity, was a favorite resort of the wealthy families of Rome, and since the fifth century has had a prominent place in the history of Italy, and especially in that of the Kingdom of Naples. Pop. of commune 15,528.

Gætulia (jē-tū'li-a), the ancient name of an extensive region of Africa, on the southern slope of Mount Atlas. It corresponds to the modern Biledulgerid, the southern part of Morocco, and the northern part of the Sahara. It was inhabited by warlike tribes, who are supposed to be the ancestors of the modern Tuaregs of the Sahara oases.

Gaff (gaf), a spar used in ships to extend the upper edge of fore-and-aft sails which are not set on stays. The fore-end of the gaff, where it embraces the mast, is termed the *jaw*, the outer end

the *peak*. The jaw forms a semicircle, and is secured in its position by a jaw-rope passing round the mast.

Gage (gāj), LYMAN JUDSON, banker, was born at De Ruyter, New York, in 1836. He entered the banking business in 1853, removed to Chicago in 1855 and became connected with the First National Bank of that city, of which he was made president in 1891. His reputation as a banker of great ability brought him the appointment of Secretary of the Treasury in President McKinley's cabinet in 1897. He held this position under Roosevelt until 1902, when he became president of the U. S. Trust Company of New York.

Gage, MATILDA JOSLYN, suffragist, was born at Cicero, New York, in 1826; died in 1898. She became an active advocate of woman suffrage, and was secretary and afterwards president of the New York State Society, and also president of the National Women's Suffrage Association and the Women's National Liberal Union. She wrote several works on the subject of women's rights.

Gahn (gän), JOHANN GOTTLIEB, a Swedish chemist, born in 1745; died in 1818. In his chemical work he was associated with Bergman, Scheele, and Berzelius. He left an account of the blowpipe and its application.

Gahnite (gän'It), a name given to automolite in honor of Gahn. It is a native aluminate of zinc, crystallizes in octa- and tetra-hedrons, is of dark green or black color, and is not affected by the blowpipe flame or by acids or alkalies.

Gaillac (gä-yȧk), a town of Southern France, department of Tarn, on the right bank of the Tarn. It exports a good red table-wine, the district abounding in vineyards. Pop. 5568.

Gaillarde (gāl'li-ard; Italian, *Gagliarda*), a lively Italian dance, in triple time; also called, from its alleged origin, *Romanesque*.

Gainesville (gānz'vil), a city, capital of Alachua Co., Florida, 70 miles S. W. of Jacksonville. Market gardening is important; and it has phosphate and fertilizer industries. It is a health resort. Pop. 6183.

Gainesville, a city, capital of Hall Co., Georgia, 53 miles N. E. of Atlanta. It has mineral springs and is a summer and health resort. Its industries include cotton goods, cotton-seed oil, etc. Pop. 5925.

Gainesville (gānz'vil), a city, capital of Cooke County, Texas, near the Trinity River and 285 miles N. E. of Austin. It has cotton compresses, packing mills, ironworks, brick and broom factories, and does a good trade. Pop. 7624.

Gainsborough (gāns'bur-o), a market town of England, county of Lincoln, 15 miles north-west of the town of Lincoln, on the Trent, which is navigable by vessels of from 150 to 200 tons, and is connected with the extensive canal navigation established to Manchester, Liverpool, Gloucester, Bristol, London, etc. Among the chief buildings are the parish church, the town hall, and the old hall or manor house, containing the assembly rooms and mechanics' institute—a large quaint building, supposed to have been partly built by John of Gaunt. There are oil mills, breweries, malt houses, etc. Pop. (1911) 20,589.

Gainsborough, THOMAS, an English painter, was born at Sudbury, Suffolk, in 1727. He was trained under the engraver Gravelot and the painter Hayman, but met with small success till his marriage with Miss Burr, a lady of beauty and fortune, in 1746. After residing for some time in Ipswich and Bath, he went in 1774 to London, where he passed the rest of his life. He was one of the original thirty-six academicians. He rivaled Sir Joshua Reynolds as a portrait painter, and showed no less originality in landscape. He died in 1788.

Gains, MYRA CLARK, a celebrated litigant, born in New Orleans in 1805; died in 1885. Her father had owned a very large estate in that city, but she had first to establish the fact of her being a legitimate child of her father, and from 1832 to the time of her death she fought in the courts for her property, which had fallen into other hands. She won favorable decisions in the U. S. Supreme Court, but the costs of the long-protracted suit ate up all the proceeds and she obtained nothing.

Gaius (gā'us), or CAIUS, a Roman lawyer of the time of Adrian and Antoninus Pius, of whose life very little is known. Of his numerous works, his *Institutes* are particularly important: first, as having been for centuries, down to the time of Justinian, one of the most common manuals of law; secondly, as having been the foundation of the official compendium of the law which occupies an important place in the reform of the judicial system by Justinian; and, thirdly, as the only tolerably full, systematic, and well-arranged source of the old Roman law. The bulk of the work in MS. was discovered in 1816 by Niebuhr.

Galactodendron (g a l - a k-tō-den'-dron). See *Cow-trees.*

Galactometer (g a l - a k-tom'e-ter). See *Lactometer.*

Galactose (ga-lak'tōs; $C_6H_{12}O_6$), a variety of s u g a r produced by boiling milk-sugar or lactose ($C_{12}H_{22}O_{11}$) with dilute sulphuric acid.

Galacz. See *Galatz.*

Galago (ga-lā'go), the native name of a g e n u s of quadrumanous mammals found in Africa. The species which are nocturnal in their habits, have long hind legs, great eyes, and large, membranous ears. The great galago (*G. crassicaudatus*) is as large as a rabbit. They live in trees, and are sought after as food in Africa.

Galanga (ga-lang'ga), or G A L A N-G A L R o o t, a dried rhizome brought from China and used in medicine, being an aromatic stimulant of the nature of ginger. It is chiefly produced by *Alpinia officinarum*, a flag-like plant about 4 feet high, with narrow, lanceolate leaves and simple racemes of white flowers. The greater galangal is the rhizome of *A. Galanga.*

Galapagos (ga-läp'a-gos; the Spanish for 'tortoises'), a group of thirteen islands of volcanic origin in the North Pacific Ocean, about 600 miles west of the coast of Ecuador, to which they belong; area, 2950 square miles. The most important is Albemarle, 60 miles long by 15 broad, and rising 4700 feet above the sea. Others are Indefatigable, Chatham, Charles, James, and Narborough. Of these, some are used by the Republic of Ecuador as penal settlements. Many of the fauna and flora of the islands are peculiar to them, the most remarkable being a large lizard and the elephant tortoise.

Galashiels (gal-a-shēlz'), a town in Scotland, on both sides of the Gala, about a mile above its confluence with the Tweed, 27 miles S. S. E. of Edinburgh. It is noted for its manufactures of tweeds, plaids, shawls, woolen yarns, etc. Pop. 13,952.

Galatea (gal-a-tē'a), in classic mythology, the daughter of Nereus and Doris, who rejected the suit of the Cyclops Polyphemus and gave herself to the Sicilian shepherd Acis. The monster, having surprised them, crushed Acis beneath a rock.

Galatia (ga-lā'sha), the ancient name of an extensive region in Asia Minor, so-called from its Gallic inhabitants, who in the first place formed part of the invading hordes of Gauls under Brennus in the third century B. C. These were compelled by Attalus, king of Pergamos, to settle within well-defined limits between Paphlagonia, Pontus, Cappadocia, Lycaonia, Phrygia, and Bithynia. With the Gauls were intermingled a considerable proportion of Greeks; hence the inhabitants were often called Gallo-græci, as well as Galatians.

Galatians (ga-lā'shans), E P I S T L E T O T H E, one of the most important epistles of St. Paul, written probably about 56 A.D., soon after his second visit to Galatia, recorded in Acts, xviii, 23. It was directed against the spread of Judaistic practices in the Galatian churches and especially against the practice of circumcision. It has been the subject of numerous commentaries by Luther, Winer, Meyer, Ellicott, Alford, and others.

Galatina (gä-la-tē'na), S A N P I E T R O I N, a town of South Italy, in the province of Lecce and 16 miles west of Otranto. Pop. about 11,000.

Galatz (gä'lats), or G A L A C Z, a town and port in Roumania, in Moldavia, on the left bank of the Danube, between the confluence of the Sereth and Pruth. It consists of an old and a new town, the latter on a hill dominating the river and commanding a fine view of the Balkans. The harbor, accessible to vessels drawing 15 feet, is well frequented, and an emporium of trade between Austria, Russia, and Constantinople. The trade was formerly entirely in the hands of the Greeks, but now many English and other foreign houses have established themselves. The chief exports are grain (principally maize), wine, planks and deals, tallow, etc. The imports are chiefly British manufactures, sugar, tin plates, iron and steel, coal, oil, fruits, tobacco, fish, glassware, leather, coarse cloth. When made a free port in 1834 it had only 8000 inhabitants, but the population has since grown to over 60,000. It ceased to be a free port in 1883.

Galaxy (gal'ak-si; *Via Lactea*, or Milky Way), in astronomy, that long luminous track which is seen at night stretching across the heavens from horizon to horizon, and which, when fully traced, is found to encompass the heavenly sphere like a girdle. This luminous appearance is occasioned by a multitude of stars so distant and blended as to be distinguishable only by the most powerful telescopes. At one part of its course it divides into two great branches, which remain apart for a distance of 150° and then reunite; many other smaller branches are given off. At one point it

spreads out very widely, exhibiting a fan-like expanse of interlacing branches nearly 20° broad; this terminates abruptly and leaves here a kind of gap. At several points are seen dark spots in the midst of some of the brightest portions; one of the most easily distinguished of these dark spots has long been known as the 'coal sack.' According to Herschel's hypothesis, our sun and planetary system form part of the Milky Way.

Galba (gal'ba), SERVIUS SULPIUS, a Roman emperor, successor of Nero, born B.C. 3. He was made prætor (A.D. 20), and afterwards governor of Aquitania, and in A.D. 33 was raised to the consulship through the influence of Livia Drusilla, the wife of Augustus. Caligula appointed him general in Germany, and Claudius sent him in A.D. 45 as pro-consul to Africa, his services there obtaining him the honors of a triumph. He then lived in retirement till the middle of Nero's reign, when the emperor appointed him governor of Hispania Tarraconensis, but soon after ordered him to be secretly assassinated. Galba revolted: the death of Nero followed (A.D. 68), and he himself was chosen emperor by the prætorian cohorts in Rome. He went directly to Rome, but soon made himself unpopular by cruelty and avarice, and he was slain in the forum in A.D. 69 at the age of seventy-two.

Galbanum (gal'ba-num), GALBAN, a fetid gum resin procured from at least two species of umbelliferous plants, which are probably *Ferŭla galbaniflŭa* and *F. rubricaulis*. It consists of the 'tears' of gum resin which exude spontaneously from the stem, especially in its lower part and about the bases of the leaves. It is brought from the Levant, Persia, and India, and is administered internally as a stimulating expectorant. It is also used in the arts, as in the manufacture of varnish. It is supposed to be yielded by other umbellifers, among which are named *Ferulāgo galbanifĕra*, *Opoidia galbanifĕra*, and *Bubon Galbanum*.

Galbulinæ (gal-bu-lī'nē), the jacamars, a family of tropical American fissirostral birds allied to the trogons and kingfishers.

Gale (gāl), a plant of the genus *Myrica*, nat. order Myricaceæ. Sweet gale or bog-myrtle (*M. Gale*) is a shrub from 1 to 3 feet high, which exhales a rather pleasant aromatic odor, and grows on wet heaths abundantly. In America the name is applied to an allied plant *Comptonia asplenifolia*. See also *Candleberry*.

Galeidæ (ga-lē'i-dē), the topes, a family of small sharks. Two species, the common tope (*Galeus canis*) and the smooth hound (*Mustĕlus vulgăris*), are abundant in British seas.

Galemys (ga-lē'mis), a genus of mammals allied to the shrews. Only two species are known, the Russian desman or muskrat (*G. moschata*) and the French desman (*G. pyrenaica*). They live in burrows at the side of streams, and feed on insects. See *Musk-rat*.

Galen (gā'len), properly CLAUDIUS GALENUS, a Greek physician, born A.D. 130, at Pergamus in Asia Minor. His father, Nicon, an architect and mathematician, gave him a careful education, and he studied under physicians in Smyrna, Corinth, Alexandria, etc., afterwards visiting Cilicia, Phœnicia, and Palestine. He returned in 103 to Pergamus, where he received a public appointment, but five years later went to Rome, and there acquired great celebrity by his cures. Driven thence by envy, he again traveled for some time and resumed his labors in his native town, but was soon after invited to Aquileia by the Emperors Marcus Aurelius and Lucius Verus (A.D. 169). He followed Marcus Aurelius to Rome, and appears to have remained there for some years before finally retiring to Pergamus. The closing part of his life, however, is obscure. One Arabic writer says that he died in Sicily, and Suidas states that he died at the age of seventy, and accordingly in the year A.D. 200 or 201; but it is not improbable that he lived longer. The writings attributed to Galen include eighty-three treatises acknowledged to be genuine; forty-five manifestly spurious; nineteen of doubtful genuineness, and fifteen commentaries on different works of Hippocrates, besides a large number of short pieces and fragments, probably in great part spurious. The most valuable of his works were those dealing with anatomy and physiology, and he was the first to establish the value of the pulse in diagnosis and prognosis. Till the middle of the sixteenth century his authority in medicine was supreme.

Galena (ga-lē'na; PbS), the sulphide of lead, found both in masses and crystallized in cubes, but sometimes in truncated octahedra; its color is bluish gray, like lead, but brighter; luster metallic; texture foliated; fragments cubical; soft, but brittle; specific gravity, 7.22 to 7.759; effervesces with nitric and hydrochloric acids. For the most part, it contains about 86.6 per cent. of lead and 13.4 of

sulphur, generally some silver, and also antimony, zinc, iron, and bismuth. Where the proportion of silver is high it is known as *argentiferous galena*, and worked with a view to the extraction of this metal. Galena occurs principally in the older or primary rocks, being found in England mainly in the Mountain Limestone (base of the Carboniferous formation). In the United States it is very abundant, the deposit of galena in which the mines of Illinois are situated being the most extensive and important hitherto discovered. The town of Galena (of less than 5000 population) is named from it.

Galena, a city of Cherokee County, Kansas, 19 miles S. E. of Columbus. Here lead and zinc are largely mined and smelted and there are large stamping and smelting works. Pop. 6096.

Galenists (gā'lin-ists), the name of the body of controversialists who, appealing to the authority of Galen, opposed the introduction of chemical and alchemical methods of treatment into medicine. They adhered to the ancient formulas, which prescribed preparations of herbs and roots by infusion, decoction, etc., while the chemists professed to extract essences and quintessences by calcination, digestion, fermentation, etc. Neither body possessed a monopoly of the truth, and modern medicine combines the better elements in each method.

Galeopithecus (ga-le-o-pi-thē'-kus). See *Flying-lemur.*

Galeopsis (ga-le-op'sis), the generic name of the hemp-nettles, a genus of plants, of the nat. order Labiatæ, characterized by the equally five-toothed calyx. They are herbaceous plants with square stems, usually clothed with sharp, bristly hairs, nettle-like leaves on long stalks, and red, white, or yellow labiate flowers. There are about twelve species, three of which are natives of Britain. The handsomest of these (*G. versicolor*) is abundant in Scotland, especially in the Highlands; it has showy, yellow flowers, with a broad, purple spot on the lower lip.

Galerius (ga-le'ri-us), a Roman emperor. See *Maximianus.*

Galesburg (gālz'burg), a city, county seat of Knox County, Illinois, 163 miles S. W. of Chicago, in a fertile farming country. It has railroad shops, iron foundries and manufactures of various kinds. Coal is abundant in its vicinity. Knox and Lombard Colleges are situated here. Pop. 24,064.

Galicia (gal-ish'e-a), KINGDOM OF, a province of Austria, bounded by Russia, Bukowina, Hungary, and Moravia; area, 30,312 square miles; pop. (Polish in the west, Russniak in the east) 7,315,810. The great physical features of the country are, in a manner, determined by the Carpathians, which form a long and irregular curve on the south, and send out branches into Galicia. Farther to the north the hills subside rapidly, and finally merge into vast plains. It has several considerable rivers, those on the west being affluents of the Vistula, those in the east, of the Danube and the Dniester. The climate is severe, particularly in the south, where more than one of the Carpathian summits rise beyond the snow-line. The summers are very warm but comparatively short. The soil in general is fertile, and yields abundant crops of cereals, hemp, flax, tobacco, etc. The domestic animals include great numbers of horned cattle, and a fine hardy breed of horses. Sheep are in general neglected; but goats, swine, and poultry abound, and bee-keeping is practiced on a large scale. Bears and wolves are still found in the forests; and all the lesser kinds of game are in abundance. The minerals include marble, alabaster, copper, calamine, coal, iron, and rock-salt. Only the last two are of much importance. Rock-salt is particularly abundant. The most important mines have their central locality at Wieliczka. Manufactures have not made much progress. The spinning and weaving of flax and hemp prevail to a considerable extent on the confines of Silesia. Distilleries exist in every quarter. The Roman Catholics and the Greek Catholics are the chief religious bodies. The chief educational establishments are the University of Lemberg and that of Cracow. The principal towns are Lemberg, the capital, and Cracow. After being the field of continuous strife between Russians, Poles, and Hungarians, Galicia continued a Polish dependency from 1382 until the first partition of Poland, in 1772, when it was acquired by Austria. Galicia is now one of the Cisleithan provinces of the Austrian Empire, and is represented in the *Reichsrath* by 63 deputies, while the affairs peculiar to itself are deliberated and determined upon by its own *Landtag* or Diet. Polish is the language of official intercourse and of the higher educational institutions.

Galicia, one of the old provinces of Spain, situated in the N. W., and bounded N. and W. by the Atlantic, S. by Portugal, and E. by the old provinces of Asturias and Leon. It is now divided into the provinces of Coruña, Lugo, Orense, and Pontevedra; area,

11,212 square miles. Its broken coast, which has a length of about 240 miles, lies open to the Atlantic, and there are a number of fine natural harbors, of which Ferrol is one of the finest naval ports in Europe. The surface is mountainous, and the proportion of good arable land limited; but fruit, particularly apples and pears, nuts, walnuts, and chestnuts, is abundant; and the culture of the vine is common in all the lower districts. The higher mountain slopes are generally covered with fine forests, which feed large herds of swine, and afford haunts to boars and wolves. Both manufactures and trade are insignificant. The chief town is Santiago de Compostella. The natives (Gallegos) speak an uncouth patois, which other Spaniards scarcely understand. The peasantry are very poor, and many leave for service in other parts of Spain. Pop. 1,941,453.

Galilee (gal'i-lē), in the time of Jesus Christ the most northern province of Palestine, bounded on the E. by the river Jordan, on the S. by Samaria, on the W. by the Mediterranean Sea and Phœnicia, and on the N. by Syria and the Mountains of Lebanon. It was in some sense the cradle of Christianity, its towns of Nazareth, Cana, Capernaum, Nain, and other places being intimately associated with the life of Christ. The inhabitants of this country, mostly poor fishermen, on account of their ignorance and simplicity of manners were despised by the Jews, who, by way of contempt, called Christians, at first, *Galileans*. At present Galilee is included in the vilayet of Syria.

Galilee, a portico or chapel annexed to a church, used for various purposes. In it public penitents were stationed, dead bodies deposited previously to their interment, and religious processions formed; and it was only in the galilee that in certain religious houses the female relatives of the monks were allowed to converse with them, or even to attend divine service. The only English buildings to which the term galilee is applied are attached to the cathedrals of Durham, Ely, and Lincoln.

Galilee, Sea of, also called Sea of Chinnereth or Chinneroth, and the Lake of Gennesaret or Tiberias, a pear-shaped fresh water lake in Central Palestine, 12½ miles long by 7½ broad. It was apparently formed by subsidence attended with volcanic disturbance; and is 682 feet below the level of the Mediterranean. On the east the coasts are nearly 2000 feet high, deeply furrowed by ravines, but flat along the summit. The whole basin is bleak and monotonous, and has a scathed volcanic look, the cliffs and rocks along the shore being of hard porous basalt. At the time of Christ there were on its shores nine flourishing cities, of which seven are now uninhabited ruins, while Magdala and Tiberias are both in a poverty-stricken condition. The lake still abounds in fish, but the fishery is neglected.

Galilei (gâl-i-lā'ē), Galileo, a most distinguished Italian physicist, born 18th Feb., 1564, at Pisa. His father, Vincenzo Galilei, a nobleman of Florence, procured him an excellent education in literature and the arts, and in 1581 he entered the University of Pisa. At nineteen the swinging of a lamp in Pisa cathedral led him to investigate the laws of the oscillation of the pendulum, which he subsequently applied in the measurement of time; and in 1586 the works of Archimedes suggested his invention of the hydrostatic balance. He now devoted his attention exclusively to mathematics and natural science, and in 1589 was made professor of mathematics in the University of Pisa. In 1592 he was appointed professor of mathematics in Padua, where he continued eighteen years, and his lectures acquired European fame. Here he made the important discovery that the spaces through which a body falls, in equal times, increase as the numbers 1, 3, 5, 7. He improved the thermometer, and made some interesting observations on the magnet. To the telescope, which in Holland remained not only imperfect but useless, he gave astronomical importance. He noted the irregularity of the moon's surface, and taught his scholars to measure the height of its mountains by their shadow. A particular nebula he resolved into individual stars, and conjectured that the Milky Way might be resolved in the same manner. His most remarkable discovery was that of Jupiter's satellites (1610), and he observed, though imperfectly, the ring of Saturn. He also detected the sun's spots, and inferred, from their regular advance from east to west, the rotation of the sun, and the inclination of its axis to the plane of the ecliptic. In 1610 Cosmo II, grand-duke of Tuscany, appointed him grand-ducal mathematician and philosopher, and with increased leisure he lived sometimes in Florence, and sometimes at the country seat of his friend Salviata, where he gained a decisive victory for the Copernican system by the discovery of the varying phases of Mercury, Venus, and Mars. In 1611 he visited Rome for the first time, where he was honorably received; but on

his return to Florence he became more and more involved in controversy, which gradually took a theological turn. The monks preached against him, and in 1616 he found himself again obliged to proceed to Rome, where he is doubtfully said to have pledged himself to abstain from promulgating his astronomical views. In 1623 Galileo replied to an attack upon him in his *Saggiatore*, a masterpiece of eloquence, which drew upon him the fury of the Jesuits. In 1632, with the permission of the pope, he published a dialogue expounding the Copernican system as against the Ptolemaic. A congregation of cardinals, monks, and mathematicians, all sworn enemies of Galileo, examined his work, condemned it as highly dangerous, and summoned him before the tribunal of the Inquisition. The veteran philosopher was compelled to go to Rome early in 1633, and was condemned to renounce upon his knees the truths he had maintained. At the moment when he arose, he is said (but this is doubtful) to have exclaimed, in an undertone, stamping his foot, 'E pur si muove!' (and yet it moves!). Upon this he was sentenced to the dungeons of the Inquisition for an indefinite time, and every week, for three years, was to repeat the seven penitential psalms of David. After a few days' detention his sentence of imprisonment was commuted to banishment to the villa of the Grand-duke of Tuscany at Rome, and then to the archiepiscopal palace at Sienna. He was afterwards allowed to return to his residence at Arcetri, near Florence, where he employed his last years principally in the study of mechanics and projectiles. The results are found in two important works on the laws of motion, the foundation of the present system of physics and astronomy. At the same time he tried to make use of Jupiter's satellites for the calculation of longitudes; and though he brought nothing to perfection in this branch, he was the first who reflected systematically on such a method of fixing geographical longitudes. He was at this time afflicted with a disease in his eyes, one of which was wholly blind and the other almost useless, when, in 1637, he discovered the libration of the moon. Domestic troubles and disease embittered the last years of Galileo's life. He died in 1642 (the year Newton was born). His remains were ultimately deposited in the church of Sta. Croce, at Florence.

Galingale (gal'in-gāl), a name applied to a kind of sedge, the *Cupĕrus longus*, or to its tubers, which contain a bitter principle, and have tonic and stomachic properties.

Galion (gal'i-on), a city of Crawford County, Ohio, 15 miles w. by s. of Mansfield. It has machine and railroad shops, road machinery, pipe, telephone and other factories, brass foundry, brick and tile works, etc. Pop. 8175.

Galipot (gal'i-pot), or FRENCH TURPENTINE, the long, soft stalactitic pieces of resin which form down the sides of the *Pinus maritima*.

Gall (gal), in the animal economy. See *Gall-bladder, Bile.*

Gall, FRANZ JOSEPH, the founder of phrenology, born in 1758 in Tiefenbrunn, in Baden; died in 1828. He studied medicine, and practiced at Vienna as a physician, where he made himself known to advantage by his *Philosophisch-medicinische Untersuchungen* (1791). After a series of comparisons of the skulls both of men and animals he was led to assign the particular location of twenty organs. For some time he confined himself to lecturing on the subject, first in Vienna, and afterwards in his travels through Germany. He then accompanied Dr. Spurzheim, in 1807, to Paris, where he published with his friend, in 1810, the *Anatomie et Physiologie du Système Nerveux en général, et du Cerveau en particulier;* and in 1812 his own *Des Dispositions innées de l'Ame et de l'Esprit, ou du Matérialisme.* Spurzheim also published, in London, a work upon his own and Gall's theories, which met with severe criticism but extended their views, and at least gave an impulse to the accurate anatomical study of the brain.

Gall, ST. (German, *St. Gallen*), a northeastern frontier canton in Switzerland, abutting on Lake Constance; partly bounded by the Rhine, and enclosing the canton of Appenzell. Its area is 780 square miles. In the south it is one of the loftiest Alpine districts of Switzerland, and in other quarters is more or less mountainous. It belongs wholly to the basin of the Rhine, in the valley of which the climate is comparatively mild; in the mountainous districts it is very rigorous. Wood and good pasture are found on the mountains; on the lower slopes and valleys, vines and orchard fruits, and corn, maize, hemp, and flax are grown. The manufactures are chiefly cotton and linen goods, particularly fine muslins. The constitution is one of the most democratic in Switzerland. German is the language spoken. Pop. 250,285.—ST. GALL, the capital and the see of a bishop, is situated on the Steinach, 2165 feet above sea-level. It contains an old cathedral, now completely modernized, and an old abbey partly converted into public offices, but containing

also the bishop's residence and episcopal library with valuable manuscripts. The manufactures consist chiefly of cotton goods, more especially embroidered muslins and prints; and the town is the entrepôt both for its own canton and those of Appenzell and Thurgau. It is of ancient origin, having grown up around the abbey of St. Gall, founded by an Irish monk of that name about the beginning of the seventh century. This abbey for several centuries held one of the highest places in the Benedictine order. Pop. (1910) 37,106.

Gallait (gâl-lā), LOUIS, a Belgian historical painter, born in 1812; died in 1887. He studied at his native town Tournai, Antwerp and Paris, where he acquired a name by his portraits as well as his genre and historical paintings. Among his earlier pictures of note were: *Christ Restoring Sight to a Blind Man; The Strolling Musicians; The Beggars; Montaigne Visiting Tasso in Prison; Abdication of Charles V.* He produced many later pictures, the last of which, *The Plague at Tournay* (1882), was purchased for the Brussels Museum at the price of 120,000 francs.

Galland (gâl-ăn), ANTOINE, a French oriental scholar, born in Picardy in 1646; principally known for his translation of the *Arabian Nights' Entertainments* (1704-1717), the first into any European language. Among his other writings are a *Treatise on Medals and Coins; Tableau de l'Empire Ottoman; De l'Origine du Café; Paroles remarquables, Bons Mots et Maximes des Orientaux*, and the *Contes et Fables Indiennes de Bidpaï et de Lokman.* In 1709 he was appointed professor of Arabic at the Collège Royal at Paris, and died in 1715 while engaged in translating the Koran.

Galla Ox, or SANGA, a remarkable variety of ox inhabiting Abyssinia. The chief peculiarity is the extraordinary size of the horns, which rise from the forehead with an outward and then an inward curve, producing an exact figure of a lyre, and finally curve a little outward and taper to the top.

Gallas (gal'las), a numerous and powerful race, chiefly inhabiting a territory in East Africa, lying to the south of Abyssinia. Their color varies from a deep black to a brownish-yellow; stature tall; bodies spare, wiry, and muscular; nose often straight, or even arched; lips moderate; hair often hanging over the neck in long, twisted plaits. They have agreeable countenances, and are brave, but ferocious and cruel, cunning and faithless. They leave the plains to their horses, sheep, and cows, while they themselves cultivate the mountains. They number 6 or 8,000,000.

Gallatin (gal'la-tin), ALBERT, statesman, was born in Geneva, Switzerland, in 1761. He was graduated at the University of Geneva in 1779 and emigrated to America in 1780. In 1789 he was a member of the Pennsylvania State Convention, in 1793 was elected United States Senator, and in 1794 helped to suppress the 'Whiskey Insurrection.' In 1801 he was appointed Secretary of the Treasury, his management of which was eminently successful. In 1814 he was one of the Commissioners at Ghent who concluded the treaty of peace with Great Britain, in 1815 was appointed Minister to France, and in 1826 was envoy extraordinary to Great Britain. He died in 1849.

Gall-bladder (gal-blad'der), a small vessel embedded in the liver and containing gall. See *Bile.*

Galle (gal), or POINT DE GALLE, a fortified seaport of Ceylon, with a good harbor, formerly important as a coaling station. Pop. 37,326.

Galleon (gal'le-on), formerly a kind of vessel of war, used by the Spaniards and Portuguese, with from three to four decks. In more recent times those vessels were called *galleons* in which the Spaniards transported treasure from their American colonies.

Gallery (gal'er-i), in architecture, a long, narrow room, the length of which is at least three times its width, often built to receive a collection of pictures. Among the most renowned European art-galleries are those of the Louvre at Paris, that of Versailles, the National Gallery in London, the Pitti and Uffizi galleries at Florence, the Dresden Gallery, the Real Museo of the Prado at Madrid, the Hermitage at St. Petersburg, the gallery of Berlin, the gallery of the Museo Borbonico at Naples, those at Venice, Antwerp, Turin, etc. The term gallery is also sometimes applied to what is more properly termed a corridor, likewise to a platform projecting from the walls of a building supported by piers, pillars, brackets, or consoles, and in churches, theaters, and similar buildings, to the upper floors going round the building next the wall.

Galley (gal'i), a low, flat-built vessel with one deck, and navigated with sails and oars, once commonly used in the Mediterranean. The common galley varied from 100 to 200 feet in length, those of smaller sizes being known respectively as half-galleys and

quarter-galleys. They carried as many as twenty oars on each side, each oar worked by one or more men, and they had commonly two masts with lateen sails. Raised structures in the stern, and even in the prow, were uncommon. These, however, were more fully developed in the kind of galley known as the *galleass*, which carried three masts, from 200 to 300 rowers, and sometimes twenty guns. France formerly had a number of galleys for service in the Mediterranean, in which convicts were forced to labor. The term galley is also applied to the ships of the ancient Greeks and Romans, especially to their warships, which were propelled chiefly by oars.

Galley. See *Printing.*

Galley-slave, a person condemned to work at the oar on board a galley, being chained to the deck. This mode of punishment was common in France previous to 1748.

Gallfly (gal-flī), a name for several hymenopterous insects of the family Cynipidæ, which form the morbid products known as galls, each species seeming to be addicted to a particular plant and a particular part of the plant. The tumor or gall is due to the morbid action of an irritating fluid deposited with the egg of the insect. The large galls at the base of oak leaves are produced by the *Cynips quercus baccārum*, a fly of a brown color, with black antennæ, chestnut-brown legs, and white wings. The small galls on the under surface of oak leaves are due to another species, *C. quercus folii*, those on the stems of oaks to *C. terminālis*. The shrubby oak (*Quercus infectoria*) of Syria is attacked by *C. gallæ tinctoriæ*, which gives rise to the hard gall or gallnut, which is chiefly used in commerce. The hairy gall of the rose, called a *bedeguar*, is also the work of a species of *Cynips*. The larvæ in this, as in the oak gall, do not come out till the following spring. See *Galls.*

Gallia. See *Gaul.*

Galliard (gal'yard), the name of a lively dance, similar to the *Romanesca*, a favorite Italian dance. The air is quick and lively, with a flowing melody. The word is due to the Spanish *gallarda*. Many galliard tunes are still extant, such as *The King of Denmark's Galliard, The Earl of Essex's Galliard*, etc. See *Gaillarde.*

Gallic Acid (gal'ik) ($C_7H_6O_5$), an acid which derives its name from the gallnut, whence it was first procured by Scheele in 1786. It exists ready formed in the seeds of the mango, has been found besides in many other plants, in acorns, colchicum, dividivi, hellebore root, sumach, tea, walnuts, etc., and is a product of the decomposition of tannic acid. It crystallizes in brilliant prisms, generally of a pale-yellow color. It colors the persalts of iron of a deep bluish black. It is of extensive use in the art of dyeing, as it constitutes one of the principal ingredients in all the shades of black, and is employed to fix or improve several other colors. It is well known as an ingredient in ink. See *Ink.*

Gallican Church (gal'i-kan), a distinctive name applied to the Roman Catholic Church in France. The peculiarity of this church consists (or consisted) not in any diversity of doctrine or practice from those generally held and observed by Roman Catholics in other countries, but in maintaining a greater degree of independence of the papal see, more especially by denying the validity of many of the decretals issued since the time of Charlemagne, and refusing to allow the pope to interfere with the civil jurisdiction of the state and the sovereign rights of the crown. The freedom asserted in this respect was increasingly recognized by the pragmatic sanctions of 1269 and 1438, and was still more clearly established by the *Quatuor Propositiones Cleri Gallicani* ('Four Propositions of the French Clergy'), drawn up in convocations by the French clergy in 1682. These were:—1. The pope in secular matters has no power over princes and kings, and cannot loose their subjects from allegiance to them. 2. He is subject to the decrees of a general council. 3. His authority in France is regulated by fixed canons and the laws and customs of the kingdom and church. 4. In matters of faith his decision is not unalterable (*irreformable*). During the revolution the Gallican Church practically disappeared, and though Napoleon extorted from Pius VII a concordat for its re-establishment, no agreement was arrived at as to its organization. With the return of the Bourbons the bishops deprived by Napoleon were restored, and a new concordat concluded in 1817; but its unpopularity led the government to exact from ecclesiastics an expression of adherence to the articles of 1682. The July revolution in 1830 gave full freedom to all denominations, and a clause was inserted in the Constitutional Charter expressly declaring that each person professes his religion with equal liberty, and obtains for his worship the same protection. Later, and especially since the Vatican

Council of 1870, the position of the Gallican Church towards the popes has essentially changed, and the older Gallicanism may now be said to be represented by the Old Catholics of France.

Gallienus (gal-li-ē'nus), P. LICINIUS, a Roman emperor, associated with his father Valerianus until the capture of the latter by the Persians in 260, when Gallienus continued to reign alone. His empire was limited by the revolt of most of the legions in the provinces, who chose their commanders as Cæsars, and thus gave rise to the period known as the 'Time of the Thirty Tyrants.' Though given up to pleasure, he defeated the Goths in Thrace and Postumus in Gaul, and forced Aureolus, whom the legions of Illyria had proclaimed emperor, to take refuge in Milan. While making preparations to reduce that town he himself was assassinated A.D. 268.

Gallifet (gȧl-li-fet), GASTON AUGUSTE, MARQUIS DE, a French soldier, born at Paris in 1831. Entering the army, he was made general of brigade in 1870, subdued the revolting tribes of Africa 1872-3, and later was made general of division, and received the military medal for his brilliant handling of the army maneuvers in 1891. He retired in 1894, and was minister of war 1899-1900.

Gallinaceous Birds (gal-i-nā'shus), the order of birds now commonly known as *Rasores*.

Gall-insects. See *Gallfly*.

Gallinule (gal'i-nūl), a name for aquatic birds belonging to the family Rallidæ or rails, genera *Gallinŭla* and *Porphyrio*. They are good swimmers, though they are not web-footed, but have the toes furnished with a narrow membrane. The common gallinule, moor-hen or water-hen (*G. chlorŏpus*), is the only British species. It is black, with a red frontal shield.

Galliot (gal'i-ot), a Dutch or Flemish vessel for cargoes, with very rounded ribs and flattish bottom, with a mizzenmast placed near the stern, carrying a square mainsail and maintopsail, a forestay to the mainmast (there being no foremast), with fore aysail and jibs.

Gallipoli (gal-ip'o-lē; ancient *Callipŏlis*), a seaport of Southern Italy, in the province of Lecce, on a rocky peninsula in the Gulf of Taranto, 47 miles southeast of Taranto. It is fortified, and has a cathedral, a productive tunny fishery, and a good harbor, from which large quantities of olive-oil are exported. Pop. of commune 13,352.

Gallipoli (ancient *Callipolis*), a town in European Turkey on a peninsula of the same name at the northeast end of the Dardanelles, 128 miles W. S. W. of Constantinople. It was once fortified, but is now in a generally dilapidated condition, with no edifice of note except the bazaars. It was the gate by which the Turks entered Europe (1357), and in the Crimean war the allied forces landed here (1854). A British military force landed on the peninsula in April, 1915, and an allied force in August, in an effort to take Constantinople by an overland march. The invasion ended in disaster.

Gallipoli Oil, a coarse olive-oil used in Turkey-red dyeing and for other purposes, and prepared from olives grown in Calabria and Apulia, the latter being considered the best. The oil is conveyed in skins to Gallipoli, where it is clarified and shipped.

Gallipolis (gal-le-po-lēs'), a city, seat of Gallia County, Ohio, on the Ohio River. It has furniture factories, foundries, flour mills, and the Ohio Hospital for Epileptics. Pop. 5560.

Gallium (gal'li-um), a rare malleable metal, discovered by spectrum analysis in 1875 by De Boisbaudran in the zinc-blende of Pierrefitte in the Pyrenees. It is of a grayish-white color, has a brilliant luster, and is fused by the mere warmth of the hand. In its properties it is related to aluminium.

Dutch Galliot.

Galliwasp (gal'i-wȧsp), the *Celestus occiduus*, a species of lizard about 1 foot in length, and remarkably stout and plump. Its general color is brown. It is a native of the West Indies, and is particularly common in Jamaica, where it is much dreaded, though without reason.

Gallnuts (gal'nuts), See *Galls*.

Gallon, a measure of capacity containing four quarts. Various gallons seem to have been formerly used, but in 1689 in Great Britain the wine gallon was declared by law to contain 231 cubic inches, and this is the present standard in the U. S. for liquids and represents the volume of 8.33888 lbs. avoirdupois of pure water at 39.2° F. The U. S. dry gallon is 268.8025 cubic inches or 1.16365 liquid gallons. The British imperial gallon now in use contains 10 lbs. avoirdupois of distilled water, or 277.274 cubic inches.

Galloway (gal'ō-wā), a district in the southwest of Scotland, now regarded as embracing Wigtownshire and Kirkcudbright. It has given name to a breed of horses and one of cattle.

Galls (gals), gallnuts or nutgalls, a vegetable excrescence produced by the deposit of the egg of an insect in the bark or leaves of a plant. The galls of commerce are produced by a species of *Cynips* (see *Gallfly*) in the tender shoots of the *Quercus infectoria*, a species of oak abundant in Asia Minor, Syria, Persia, etc. They are spherical and tubercular, and vary in magnitude from the size of a pea to that of a hazelnut. White, green, and blue varieties are recognized, the latter kinds being the best. They are inodorous, but are strongly astringent from the tannin and gallic acid which they contain, and which are their chief products. Gallnuts are extensively used in dyeing and in the manufacture of ink, and they are also frequently used in medicine. They are chiefly imported from Aleppo, Tripoli, and Smyrna. The Chinese galls, or *woo-pei-tsze*, differ from the foregoing in that they are really an unusually massive kind of crust or cocoon, such as the aphides form on the surface of a plant; the tissues of the plant not being affected.

Gall-stones, or BILIARY CALCULI, pathological concretions derived from the bile, causing the condition known as cholelithiasis. They may be small and numerous, many hundreds of them being sometimes contained in a distended gall-bladder; or large, sometimes over five inches in length; and sometimes they occur in the form of a gritty sand. In the majority of cases they produce no symptoms, but when they become impacted in the cystic or common bile duct, acute symptoms of biliary colic general supervene. The attack is usually sudden and marked by agonising pain, vomiting, high temperature, etc. It rarely lasts more than a few days, but as gall-stones seldom occur singly, there is danger of a subsequent attack. The pain is said to be the most severe of all forms of suffering.

Galsworthy (gâls'wĕr-thi), JOHN, a British novelist and playwright, born in 1867. His novels include *The Country House*, 1907; *A Commentary*, 1908; *Fraternity*, 1909; *A Motley*, 1910; *The Patrician*, 1911; and his plays, *The Silver Box*, 1906; *Joy*, 1907; *Strife*, 1909; *Justice*, 1910; *The Little Dream*, 1911.

Galt (gâlt), a town of Waterloo Co., Ontario, on Grand River, 25 miles N. N. W. of Hamilton. Pop. 10,290.

Galt (gâlt), SIR ALEXANDER TILLOCH, a Canadian statesman, was born in London, England, in 1817; died in 1893. In 1849, he was elected a member of Parliament, and became active in public affairs, filling many important offices. He was a fluent speaker and an able minister of finance.

Galt, JOHN, a Scottish novelist, born at Irvine in Ayrshire in 1779. He went to London in 1804, printed an epic, and tried both commerce and law; but failing in each, went abroad. On his return he published his *Voyages and Travels*, his *Letters from the Levant*, a *Life of Cardinal Wolsey*, and a volume of tragedies. He became a contributor to periodicals, and fiction writer. His *Ayrshire Legatees* (1820), with its humorous descriptions of Scottish middle and low life indicated the true scope of his faculty, and it was followed by his *Annals of the Parish* (1821), *The Provost* (1822), *Sir Andrew Wylie* (1822), and *The Entail* (1823) He went out to Canada as superintendent to the Canada Company in 1826, founded the town of Guelph, returned in 1829, and died in 1839. His son, SIR THOMAS TILLOCH, was an eminent statesman.

Galton (gal'tun), FRANCIS, scientist, born at Duddeston, near Birmingham, in 1822. Graduating at Cambridge in 1844, he made two journeys in Africa, which led to his *Narrative of an Explorer*. He is best known by his books on *Hereditary Genius*, *Natural Inheritance*, *Finger Prints*, etc. He died in 1911.

Galvani (gâl-vä'nē), LUIGI, an Italian physician and physiologist, born at Bologna 1737; died 1798. He practised medicine in Bologna, and was in 1762 appointed professor of anatomy at the university. He gained repute as a comparative anatomist; but his fame rests on his theory of animal electricity, enunciated in the treatise *De Viribus Electricitatis in Motu Musculari Commentarius*, published in 1791. Twenty years before the publication of this treatise he had been making experiments on the relations of animal functions to electricity.

In 1797 he was deprived of his chair for refusing to take the oath of allegiance to the Cisalpine Republic, but was restored to it in less than a year. See also the article *Galvanism*.

Galvanic Battery (gal-van'ik), a combination of galvanic cells. In a galvanic cell chemical action takes place between a liquid and a metal—usually zinc—which is partially immersed in it; and there is another metal, or solid conducting substance of some kind, also partially immersed. The zinc and the other solid conductor are called the two *plates* of the cell. The plates must not be allowed to touch each other in the liquid; but a current through an external conductor can be obtained by connecting its ends with the two plates. When this connection is made there is a complete circuit round which the current flows, its course being from the zinc plate through the liquid to the other plate, and from this latter through the external conductor to the zinc plate again. There is a continual circulation of positive electricity in this direction as long as the chemical action continues, or, what is the same thing, there is a continual circulation of negative electricity in the opposite direction. The second or inactive plate is usually either of copper, of platinum, or still more frequently of gas carbon, that is, the carbon which is deposited in the retorts at gasworks. The liquid which acts on the zinc is most frequently dilute sulphuric acid—1 part of acid to 6 or 8 of water. In some of the best kinds of cell there are two liquids—one in contact with the zinc and the other with the inactive plate, with a porous partition of unglazed earthenware between them. Fig. 1 shows a battery of four cells of the simplest kind, each containing a plate of zinc and a plate of copper immersed (except their upper portions, in dilute acid contained in a glass vessel. It will be observed that the copper (C) of each cell is connected with the zinc (Z) of the next. The arrows show the direction of the current. Fig. 2 represents a very common form of battery called Bunsen's. The zinc plate consists of a slit cylinder surrounding the porous vessel in which the carbon plate stands, the whole being contained in a glass jar. The liquid in which the zinc is immersed is dilute sulphuric acid, and the liquid in contact with the carbon is strong nitric acid. Fig. 3 represents a Daniell cell, which differs from the Bunsen in the contents of the porous cell. The plate within the porous cell is of copper, and the liquid in contact with the copper is a saturated solution of sulphate of copper, crystals of which are seen heaped up round the top. These crystals are supported by a cage of copper wire, and are intended for keeping the solution saturated.

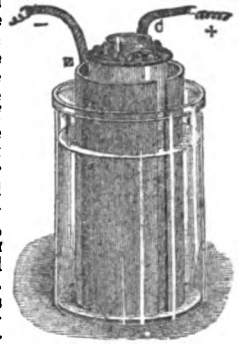


Fig. 3.—Daniell's Cell.

In the simpler forms of galvanic cell, such as that represented in Fig. 1, there is a continual evolution of hydrogen at the inactive plate, while an equivalent quantity of oxygen enters into combination with the zinc plate, and goes to form sulphate of zinc. Some of the evolved hydrogen adheres to the copper plate and produces a rapid falling off in the electromotive force of the cell. This action, which is the principal cause of the rapid weakening of the current in batteries composed of such cells, is called *polarization*. The purpose of the two-fluid arrangement illustrated in Figs. 2 and 3, is to intercept the hydrogen and prevent it from being deposited on the copper or carbon plate. In Daniell's battery, which was the first of the kind, the hydrogen is taken up by the solution of sulphate of copper, and displaces copper, which is deposited on the copper plate. In Bunsen's it is taken up by the nitric acid, which is thus gradually converted into nitrous acid.

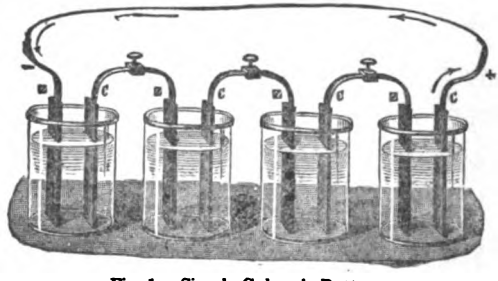


Fig. 1.—Simple Galvanic Battery.

It is usual to amalgamate the zinc

plates of a battery by washing them with acid, and then rubbing them with mercury. The reason for this operation is, that when ordinary commercial zinc is used without amalgamation, local currents are formed between different portions of the same plate, owing to inequalities or impurities. This *local action*, as it is called, eats away the plates without contributing to the current in the general circuit. Amalgamation renders the surface uniform and prevents this injurious action.

The strength of the current given by a battery depends partly on the electromotive force of the battery and partly on its resistance. If two batteries are connected into one circuit in such a way that they tend to drive currents round it in opposite directions, the one which prevails is said to have the greater electromotive force. The electromotive force is proportional to the number of cells, and is independent of their size. As regards resistance, the current will be strongest when the resistance is least; that is, when the plates are very large and very near together.

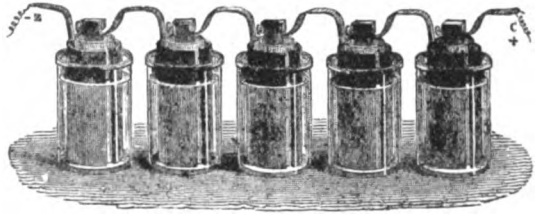


Fig. 2.—Bunsen's Battery.

Whenever chemical action takes place, heat is produced; but in the ordinary use of a galvanic battery only a portion of this heat is produced in the cells themselves; the rest of it is produced in the external conductor. When we heat a wire by sending the current of a battery through it, the heat generated in the wire is a portion of the heat due to the chemical action in the cells. In cells of high electromotive force the heat due to the chemical action is greater (for the same quantity of zinc dissolved) than in cells of low electromotive force. It is much higher for a Bunsen than for a Daniell cell.

Galvanism (gal'van-izm), the production of electricity by means of the galvanic battery (which see). The name is derived from Galvani, professor of anatomy at Bologna, who observed that the limbs of a dead frog could be caused to move by the contact of metals. His experiments attracted the attention of Volta, professor of natural philosophy at Pavia, who shortly afterwards invented the galvanic or voltaic battery.

Galvanized Iron (gal'van-izd), a name incorrectly given to sheets of iron coated with zinc by a non-galvanic process, the iron being first cleansed by friction and the action of dilute sulphuric acid, and then plunged into a bath composed of melted zinc and other substances, as sal ammoniac or mercury and potassium. More properly the name is given to sheets of iron coated first with tin by a galvanic process, and then with zinc by immersion in a bath containing fluid zinc covered with sal ammoniac mixed with earthy matter. So long as the coating is entire, and so long as it is not exposed to corrosive substances, galvanized iron is very durable. The best variety is immersed into the zinc three times and rubbed smooth between the dippings.

Galvanometer (gal-va-nom'e-ter), an instrument for measuring an electric current by the deflection of a magnetic needle. The current flows through a wire coiled usually into the form of a circle, which is placed vertically in the magnetic meridian and surrounds the needle. When no current is passing the needle points north and south, and the

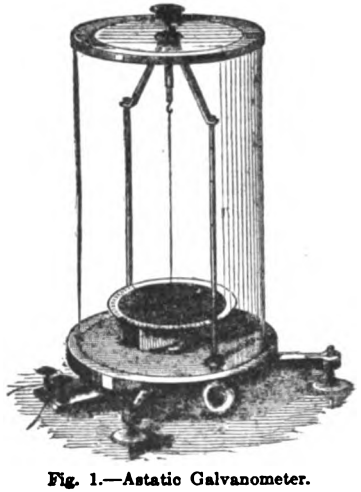


Fig. 1.—Astatic Galvanometer.

galvanometer should be so placed that the needle when so pointing lies in the plane

of the coil. When a current passes through the coil, it exerts a force upon the needle tending to set it at right angles to the plane of the coil—that is, to set it east and west. The action of the earth, on the other hand, tends to set it north and south, and it will actually take an intermediate position which varies with the strength of the current. This position is read off on a graduated circle (the upper of the two graduated and horizontal circles in Fig. 2), usually by means of a long light pointer (shown in the figure) which is attached to the needle at right angles. In some galvanometers, as in that represented in Figure 2, the coil can be turned till it overtakes the needle. The lower graduated circle is for the purpose of measuring the amount of this rotation.

Fig. 2.—Sine Galvanometer.

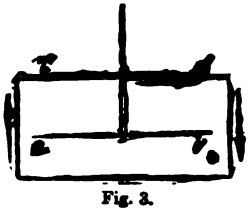


Fig. 3.

For measuring very feeble currents, it is more usual to employ the 'astatic' galvanometer, represented in Fig. 1. It has two needles, *a' b'*, *a b* (Fig. 3), as nearly equal as possible, fastened to one upright stem, *with their poles pointing opposite ways*. The directive actions of the earth on the two needles are opposite, and hence the resultant directive action of the earth on the two combined is very small. The coil of the galvanometer, on the other hand, is so placed that the current tends to deflect both needles the same way. The coil, which is shown in section in Fig. 3, is approximately rectangular, its longest dimension being horizontal. One of the needles *a'b'* is just above and the other *a b* is below the upper part of the coil. The current in this part of the coil would urge them opposite ways if their poles were similarly directed, but as their poles are oppositely directed it urges them the same way. The current in the lower part and ends of the coil assists in deflecting the lower needle, and is too distant from the upper needle to have much effect upon it. The coil is thus placed in a position of great advantage as compared with the earth, and the deflection is proportionately large.

Much greater sensitiveness can be obtained by the use of the mirror-galvanometer (Fig. 4). The round box in the center contains a coil of some hundreds of convolutions, with a very small needle fastened to a little glass mirror suspended in its center by a silk fiber. The mirror, with the needle fastened to its back, is shown at M in Fig. 5. Light from a lamp comes through the hole S and falls upon the mirror, which, being slightly concave, reflects it to a focus on the scale A A, where a bright image of the flame is accordingly seen. The smallest angular movement of the mirror causes a very visible movement of the bright image on the scale. The curved bar M in Fig. 4 is a magnet (called the *controlling magnet*), which can be raised or lowered, and turned round. One use of it is to bring the needle into the plane of the coil when the coil is not standing north and south.

Fig. 4.—Mirror Galvanometer.

Galvanoplasty (gal-van-o-plas'ti), Same as *Electrometallurgy*.

Galveston (gal'ves-tun), a seaport of Texas, at the northeast extremity of Galveston Island, at the mouth of Galveston Bay, about 200 miles W. by S. from New Orleans. It is the most flourishing port in the Gulf of Mexico, especially for the exportation of cotton, of which the shipments are very large. The chief buildings are the custom and market houses, the town-hall, a number of churches, including a Gothic Episcopal Church and Roman Catholic cathedral, and the Roman Catholic University of St. Mary. There are nine miles of street railroad, and a canal connects the port with Brazos River. In September, 1900, the city was struck by a tropical hurricane, the pressure of the wind being so great as to lift the waves many feet above the high tide level, the inflowing gulf water sweeping all before it. The loss of life was over 8000, and the de-

struction of property very great. The ruined part of the city has been rebuilt and raised several feet and strong seawalls erected to keep out any future flood.

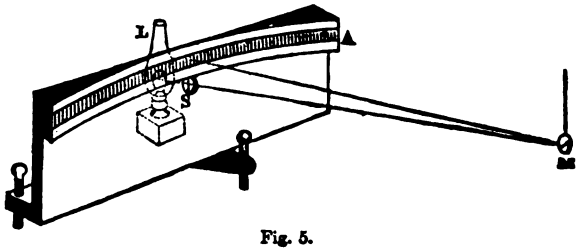


Fig. 5.

In addition to the commerce, there are numerous manufacturing industries. Pop. 36,981.

Galway (gal'wā), a seaport of Western Ireland, province of Connaught, capital of county of same name, at the mouth of the Corrib, in Galway Bay, 117 miles west of Dublin. It consists in its older parts of narrow, irregular streets with antique houses, crowded with a pauper population; in the more modern parts it is spacious and well built. Besides numerous churches and chapels, it has three monasteries and five nunneries. The town-house and county-hall and the Queen's College are among its best buildings. The manufactures are insignificant, and the trade, though once important, is no longer worthy of its excellent harbor. The chief exports are agricultural produce and marble. There are mills for sawing and polishing marble, a brewery, distillery, etc. Pop. 13,414. The county, which is washed by the Atlantic, has an area of 2372 sq. miles, of which one-eighth is under crops. In the northwest or district of Connemara, it is rugged and mountainous; in the east, level but extensively covered with bog; and in the south, fertile and tolerably well cultivated, producing wheat, barley, and oats. Lough Corrib, which lies wholly within it, is the third largest lake in Ireland. The minerals include lead, limestone, marble, and beautiful serpentine. The fisheries are valuable, but much neglected. The principal manufactures are coarse woolens and linens. Pop. 192,549.

Galway Bay, a large bay on the west coast of Ireland, between County Galway on the north and County Clare on the south, about 30 miles in length and from 20 to 7 miles in breadth. Across its entrance lie the Aran Islands, and there are numerous small islands in the bay itself.

Gama (gä'ma), Dom Vasco da, the first navigator who made the voyage to the East Indies by the Cape of Good Hope, was born in 1450 at Sines, Portugal, of a noble family. The voyage had been projected under John II, and his successor, Emmanuel the Fortunate, having fitted out four vessels, entrusted Gama with the chief command. He sailed from Lisbon on July 8th, 1497, and doubling the Cape, visited Mozambique, Mombaza, Melinda, and Calicut, returning to Lisbon in 1499. For this exploit he was named Admiral of the Indies and received the title of Dom, with an annual pension and extensive privileges in Indian commerce. In the year 1502 he was placed at the head of a powerful fleet, with which he provided for the security of future voyagers by founding establishments at Mozambique and Sofala. He also inflicted signal reprisals on the town of Calicut, where the Portuguese residents had been massacred, and established the first Portuguese factory in the Indies. He re-entered Lisbon in 1503, and passed the next twenty years in obscurity. In 1524 he was appointed Viceroy of India by King John III, but his administration lasted only three months, his death taking place at Goa in the December of that year.

Gama Grass. See *Buffalo Grass.*

Gamaliel (ga-mā'li-el), the name of two persons mentioned in Bible history, of whom the first, Gamaliel, the son of Pedahzur (Numbers, i, 10; ii, 20; vii, 54, 59; x, 23) was prince or head of the tribe of Manasseh. The other and better known Gamaliel is mentioned twice in the Acts of the Apostles as a learned doctor of the law, of the sect of the Pharisees. From Acts, xxii, 3, we learn that he was the preceptor of St. Paul; the other reference (Acts, v, 34) records his famous advice to the Sanhedrim as to their treatment of the apostles. According to tradition, Gamaliel became a Christian, and was baptized by St. Peter and St. Paul.

Gambeson (gam'be-sun), See *Acton.*

Gambetta (gam-bet'a), Leon Michel, a French orator and statesman, born in 1838 at Cahors, of a family of Genoese extraction. He was educated for the church, but finally decided in favor of the law, and repairing to Paris became

a member of the metropolitan bar in 1859. In November, 1868, he gained the leadership of the republican party by his defense of Delescluze, a noted republican. In 1869, having been elected by both Paris and Marseilles, he chose to represent the southern city; and in the Chamber of Deputies showed himself an irreconcilable opponent of the empire and its measures, especially of the policy which led to the war with Prussia. On the downfall of the empire, after the surrender of Sedan in 1870, a government for the national defense was formed, in which Gambetta was nominated minister of the interior. The Germans having encircled Paris, he left that city in a balloon, and set up his headquarters at Tours, from which, with all the powers of a dictator, he for a short time organized a fierce but vain resistance against the invaders. After the close of the war he held office in several short-lived ministries, and in November, 1881, accepted the premiership. The sweeping changes proposed by him and his colleagues speedily brought a majority against him, and after a six weeks' tenure of office he had to resign. The accidental discharge of a pistol caused his death in December, 1882.

Gambia (gâm'bi-a), a British colony in West Africa, at the mouth of the river Gambia; area, 69 square miles. The climate is very unhealthy in the rainy season, and there is little fertile land in the colony, but a considerable trade is done in ground-nuts, hides, bees'-wax, rice, cotton, maize, ivory, ginger, gum-arabic, palm-oil, etc. Pop. 13,500.

Gambia, a river of West Africa, rising in a mountainous district in Futa Jallon and flowing N. W. and W. to the Atlantic; length about 1400 miles. It is navigable for 600 miles during seven months of the year for vessels of 150 tons, but from June to November the river becomes a torrent, rising from 20 to 50 feet and leaving a rich alluvial deposit on its shores.

Gambier Islands (gam'bi-ẽr), a group of small coral islands in the South Pacific, about lat. 23° 8′ S. and lon. 134° 55′ W.; belonging to France. The vegetation is luxuriant and there are numerous birds but no indigenous quadrupeds. A French mission station was formed on the largest island, Mangareva, in 1834. Pop. about 2300.

Gambier, an astringent, earthy-looking substance chiefly employed in tanning and dyeing, and obtained from East Indian trees *Uncaria* (*Nauclea*) *gambir* and *U. acida*, order Cinchonaceæ. It is mainly imported from Singapore. Also called *Terra Japonica* and *Pale Catechu*.

Gambling. See *Gaming*.

Gamboge (gam-bōj'; from *Camboja* or *Cambodia*), a concrete, vegetable, inspissated juice or sap, or gum-resin, yielded by several species of

Gamboge Plant (*Garcinia Hanburii*).

trees. The gamboge of European commerce appears to be mainly derived from *Hebradendron gambogoides* (or *Garcinia Morella*), a diœcious tree with handsome laurel-like foliage and small yellow flowers, found in Cambodia, Siam, and in the southern parts of Cochin-China. It is yellow, and contained chiefly in the middle layer of the bark of the tree; it is obtained by incision, and issues in the form of a yellowish fluid, which, after passing through a viscid state, hardens into the gamboge of commerce. It consists of a mixture of resin with 15 to 20 per cent. of gum. Gamboge has drastic purgative properties, but is seldom administered, except in combination with other substances. In doses of a drachm or even less it produces death. Other species of *Garcinia* yield a similar drug, which is collected for local use, but not for exportation. The so-called American gamboge is the juice of *Visima Guianensis*.

Gambrinus (gam-bri'nus), a mythical king of Flanders, to whom is ascribed the invention of beer. His figure, often seated on a cask, and holding a foaming tankard, is familiar in German beer cellars.

Game Laws (gām lạs), laws relating to the killing of certain wild animals pursued for sport, and called game. Formerly in Britain certain qualifications of rank or property were needed to constitute the right to kill game; but by the Game Act of William IV the necessity for any qualification except the possession of a game certificate was abolished, and the right given to any one to kill game on his own land, or on that of another with his permission. The animals designated as

game by this act are hares, pheasants, partridges, grouse, heathgame, or moorgame, blackgame, and bustards. Poaching, or trespassing in pursuit of game, is punished by severe laws, especially if done at night. In the United States any one is free to capture or kill wild animals, subject to the laws of trespassing, but laws have been enacted for the protection of game during the breeding season, so as to prevent its extermination. Each state has its own game laws, applicable to its special game animals and covering its various wild animals and birds, and river and lake fish are protected during certain seasons under similar laws.

Game Preserves, enclosures for the preservation of game, for the benefit of royal or other hunters, which have for centuries been common in Britain and other countries of Europe. They have only recently been introduced into the United States, in which the hunting grounds have long been freely open to the hunter. Their purpose here is the preservation and increase of wild animals instead of their destruction. Deer parks have long been kept in this country, but the first systematic attempt to foster wild game was made about 1860 by Judge J. D. Caton, in a park of Ottawa, Illinois. Chief among those that followed on a large scale is the great game park of Austin Corbin, near Newport, N. H., an enclosure of 36,000 acres, in which a wire fence 8 feet high encloses an oblong tract 12 by 5 miles, through which passes a mountain range 3000 feet high. American game of all kinds are kept here, from buffalo, elk, and moose to the smaller and more timid varieties, and there has been a rapid increase. Dr. J. Seward Webb has a 9000-acre preserve in the Adirondacks, and various other large parks have been established elsewhere, in which our fast disappearing game animals are augmenting in numbers and game birds of foreign origin have been introduced.

Games (gāms), a name of certain sports or amusements carried on under regular rules and methods, as with cards or dice, billiards, tennis, etc. Among the ancients there were public games or sports, exhibited on solemn occasions, in which various kinds of contests were introduced. The Grecian games were national festivals attended by spectators and competitors from all parts of Greece, the chief being the Olympic, Pythian, Nemean, and Isthmian. They consisted of chariot races, running, wrestling, and boxing matches, etc., and to be victorious in one of these contests was esteemed one of the highest honors of a Greek citizen. The Roman games (*ludi*) were held chiefly at the festivals of the gods. They might, however, be exhibited by private persons to please the people, as the combats of gladiators, theatrical representations, combats of wild beasts in the amphitheater, etc. With the exception of the gladiatorial and wild beast combats, most of these games have descended to modern times and have been supplemented by others of modern invention, while efforts are being made to eliminate those of a brutal character. See such articles as *Billiards*, *Chess*, *Cricket*, *Football*, etc.

Gaming (gām'ing), or GAMBLING, the practice of indulging in games involving some element of chance or hazard with a view to pecuniary gain. In many countries such games, and the collateral practices of betting on events, taking shares in lotteries, etc., are legally prohibited or restricted, as being frequently associated with fraud and as themselves demoralizing. At other times governments, tempted by the prospect of gain, have openly encouraged gambling by licensing gaming houses, or instituting lotteries under their own authority. (See *Lottery.*) In France public gaming-tables were suppressed from January 1, 1838, but lotteries are still sometimes carried on. Previous to the formation of the German Empire gambling was encouraged in both of the ways referred to in several of the principalities of Germany. Baden-Baden, in the Grand-duchy of Baden, and Homburg, in Hesse-Homburg, were the two most famous resorts in Europe of the frequenters of gaming-tables. After the formation of the empire gaming was suppressed in these places (December 31, 1872), and since that time the Italian principality of Monaco has become the last public resort of this species of gambling.

In Great Britain enactments dating back for centuries have been passed for the regulation of gambling, though it is practically impossible to eradicate it. In this country statutes have been passed in most, if not all, of the States, forbidding gambling for money at certain games, and prohibiting the recovery of money lost at such games. Gambling, however, is very widely practised in most of our great cities.

Gamut (gam'ut), or GAMMUT, in music, the entire series of musical tones in the natural order of ascent or descent. With the musicians of the eleventh century A represented the lowest note in their instruments, and

a lower note having been introduced, the Greek gamma (Γ) was taken to represent it. From its prominent place as first note of the scale its name was taken to represent the whole.

Gandak, GUNDUK (gun-duk'), a river of Northern Hindustan, rising in the Himalayas and entering the Ganges; length 400 miles.

Gandia (gän'dē-ä), a town and port of Spain, in the province and 34 miles south by east of Valencia, on the Alcoy. It is walled and well built, with a handsome Gothic church and a fine palace of the dukes of Gandia. Pop. 10,026.

Gando (gän'dō), a kingdom of the Western Soudan, intersected by the Niger, and inhabited chiefly by Fellatahs, with a capital of same name. It is very fertile, and has a population estimated at 5,500,000. Mohammedanism is the prevalent religion. The ruler is a sultan subordinate to that of Sokoto.

Ganesa (ga-nā'sa), an Indian god, the son of Siva and Pâryati, represented by a figure half man half elephant, having an elephant's head. He is the god of prudence and good luck, and is invoked at the beginning of all enterprises. There are not many temples dedicated to him, and he has no public festivals, but his image stands in almost every house.

Ganesa.

Ganga (gan'ga), a name given to the sand-grouse (*Pterocles arenarius*).

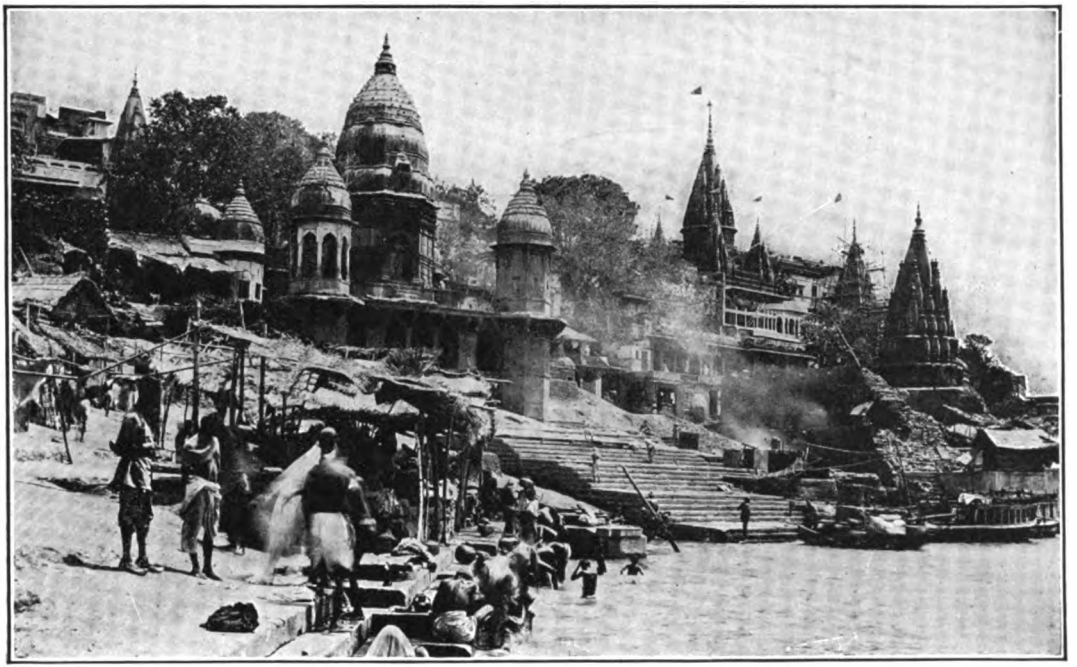
Ganga, in Hindu mythology, the personified goddess of the river Ganges.

Ganges (gan'jēz), a river of Hindustan, one of the great rivers of Asia, rising in the Himalaya Mountains, in Garhwâl state, and formed by the junction of two head streams, the Bhagirathi and the Alaknanda, which unite at Deoprag, 10 miles below Srinagar, 1500 feet above sea level. The Bhagirathi, as being a sacred stream, is usually considered the source of the Ganges, rising at the height of 13,800 feet, but the Alaknanda flows further and brings a larger volume of water to the junction. At Hardwar, about 30 miles below Deoprag, the river fairly enters the great valley of Hindustan, and flows in a southeast direction till it discharges itself by numerous mouths into the Bay of Bengal, after a course of about 1700 miles. During its course it is joined by eleven large rivers, the chief being the Jumna, Son, Ramganga, Gumti, Gogra, Gandak, and Kusi. In the rainy season the flat country of Bengal is overflowed to the extent of 100 miles in breadth, the water beginning to recede after the middle of August. The Ganges delta has the Hugli on the west, the Meghna on the east, and commences about 200 miles, or 300 by the course of the river, from the sea. Along the sea it forms an uninhabited swampy waste, called Sunderbunds, or Sundarbans, and the whole coast of the delta is a mass of shifting mud banks. The westernmost branch, the Hugli, is the only branch commonly navigated by ships. The Meghna, or main branch, on the east is joined by a branch of the Brahmaputra. Some of the principal cities on the Ganges and its branches, ascending the stream are Calcutta, Murshedabad, Bahar, Patna, Benares, Allahabad, Cawnpore, and Furruckabad. The Ganges is navigable for boats of large size nearly 1500 miles from its mouths, and it forms a great channel for traffic. It is an imperative duty of the Hindus to bathe in the Ganges, or at least to wash themselves with its waters, and to distribute alms, on certain days. The Hindus believe that whoever dies on its banks, and drinks of its waters before death, is exempted from the necessity of returning into this world and commencing a new life. The sick are therefore carried to the bank of the Ganges, and its water is a considerable article of commerce in the remoter parts of India.

Ganges Canal, UPPER, a lateral canal in Northern India (N. W. Provinces), constructed for purposes of irrigation and supplementary navigation, extending on the right of the Ganges from Hardwar to Cawnpore. The trunk of the canal measures 445 miles, and the total cost of the works has been about $14,000,000.—The LOWER GANGES CANAL is a sort of continuation of the Upper, intended for irrigation purposes.

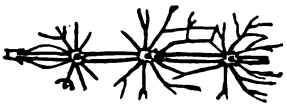
Gangi (gän'jē), a town of Italy, prov. Palermo, overlooked by an old castle. Pop. 11,551.

Ganglion (gang'gli-un), in anatomy, an enlargement occurring



ALONG THE GANGES AT BENARES

somewhere in the course of a nerve, and containing nerve cells in addition to nerve filaments. There are two systems of nerves which have ganglia upon them.



GANGLION.

Part of the nervous system of the larva of a beetle. (*Calosoma sycophanta*). *a a*, Ganglia.

First, those of common sensation, whose ganglia are near to the origin of the nerve in the spinal cord. Secondly, the great sympathetic nerve, which has ganglia on various parts of it. In the invertebrates, ganglia are centers of nervous force, and are distributed through the body in pairs, one for each ring of the body, connected by fibers, as in the figure. The cerebral ganglia of vertebrates are the brain itself, the masses of gray matter at the base of the brain, as the optic thalamus, etc.

Gangpur (gäng'pör), a native state of Bengal, in Chota Nagpur, consisting mainly of hills, forest, and jungle; area, 2484 sq. miles; pop. about 238,896.

Gangrene (gang'grēn), the death of some part of a living body, wherein the tissues begin to be in a state of mortification, there being also complete insensibility. A gangrened part must be removed either by amputation or by natural process, but if a vital part is so affected death will ensue.

Gangue (gang), a mineral substance surrounding a metallic ore in a vein.

Gangway (gang'wā), a narrow platform or bridge of planks along the upper part of a ship's side for communication fore and aft: also a sort of platform by which persons enter and leave a vessel.—In the House of Commons the gangway is a passage across the house, which separates the ministry and the opposition with their respective adherents, who sit on seats running along the sides of the house, from the neutral or independent members, who occupy seats running across. Hence, the phrase *to sit below the gangway*, as applied to a member, implies that he holds himself as bound to neither party.

Ganja. Same as *Hashish*.

Ganjam (gun-jäm'), a decayed town of India, in the Madras Presidency, formerly capital in the district of same name, near the coast of the Bay of Bengal. It was at one time a flourishing place; but the town has declined since the epidemic of 1815, when Berhampur became the headquarters. The principal arm of the Ganjam River, which enters the sea to the south of the town, is about one-third of a mile broad. —The district, one of the five Circars, is one of the most productive under the Madras Presidency, yielding rice, cotton, sugar, rum, and pulse, etc. Area, 8313 square miles; pop. 2,010,256.

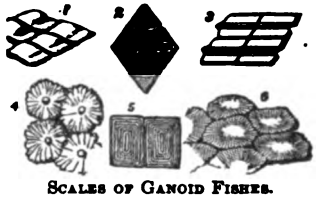
Gannet (gan'et), the solan goose, a bird of the genus *Sula* (*S. Bassana*), family Pelecanidæ. It is about 3 feet in length, and 6 in breadth of wings from tip to tip; the whole plumage, a dirty white, inclining to gray; the eyes a pale yellow, surrounded with a naked skin of a fine blue color; the bill straight, 6 inches long, and furnished beneath with a kind of pouch. It is found from the Arctic Sea to the Gulf of Mexico; breeds in immense numbers on the rocky islands near the coast of Labrador. The male and female are nearly alike. The food

Gannet or Solan Goose (*Sula Bassana*).

of the gannet consists of salt-water fish, the herring and pilchard being the staple. It takes its prey by darting down on it from a considerable height. It makes its nests, which are composed chiefly of turf and seaweed, in the caverns and fissures of rocks, or on their ledges. The female lays only one egg, though, if it be removed, she will deposit another. The young, which are much darker than the old birds, remain in the nest until nearly their full size, becoming extremely fat. In St. Kilda they form the principal food of the inhabitants, being taken by men lowered from the top of the cliffs.

Ganoids (gan'oidz; *Ganoidei*), the second order of fishes according to Agassiz. The families of this order are chiefly characterized by angular, rhomboidal, polygonal, or circular scales composed of horny or bony plates covered with a thick plate of glossy, enamel-like substance. The ganoids were

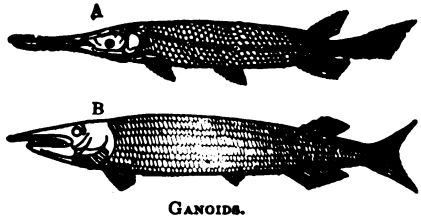
most numerous in Palæozoic and early Mesozoic times, but are now represented by seven genera:—*Lepidosteus*, the bony pikes or garpikes of the North American fresh-water lakes; *Polyptĕrus*, repre-



Scales of Ganoid Fishes.

1, Lepidosteus. 2, Cheiracanthus. 3, Palæoniscus. 4, Cephalaspis. 5. Dipterus. 6. Acipenser.

sented by a single species occurring in rivers of tropical Africa; *Calamoichthys*, a similar genus found in Old Calabar; *Amia*, the fresh-water mudfish of North America; *Acipenser*, represented by the sturgeon; *Scaphirhynchus*, best known by the so-called shovel-nosed sturgeon of the Mississippi basin; and the genus *Polyodon* or *Spatularia*, the paddle-fishes of the Mississippi and great rivers of China. Of the extinct ganoids the most remarkable are the placoderms of the Silurian



Ganoids.

A, *Lepidosteus osseus*, the 'Gar-Pike' of the American Lakes; B, *Aspidorhynchus*, restored (after Agassiz), a Jurassic Ganoid allied to *Lepidosteus*, but having a homocercal tail.

and Devonian period, comprising the earliest known remains of fishes. The Palæozoic ganoids have all heterocercal tails, forms with diphycercal tails not appearing till the secondary period.

Gantung Pass (gan'tung), a wild pass in the Western Himalayas between Bussahir in the Punjab and Tibet. It is covered with perpetual snow, and is 18,295 feet in height.

Ganymede (gan'i-mēd), in Grecian mythology, great-grandson of Dardanus, the founder of Troy, and son of Tros and of Callirrhoë, daughter of Scamander. Zeus sent his eagle to carry him off from Mount Ida to Olympus, where he held the office of cupbearer to the immortals in succession to Hebe.

Gaol (jāl), or Jail, a prison or place of legal confinement. See *Prison*.

Gaol Delivery, in English law, a commission to the judges on assize to try and deliver every prisoner in gaol on their arrival at the assize town.

Gap (gap), a town of Southeastern France, department of Hautes-Alpes. It is the seat of a bishop, and has a trade in wool, fruit, corn, and cattle. Pop. about 9000.

Gaper-shell (gā'per), a lamellibranchiate mollusc, the *Mya truncata*, common on the Atlantic coasts. It has an oblong shell and burrows in sand and mud, where it is sought after for bait and for the table.

Gapes (gāps), a disease of fowls and other Rasorial birds, arising from the presence in the windpipe of small parasitic worms (*Syngamus trachealis*), which, by obstructing the process of inhalation, cause the bird to continually gasp for breath.

Garancin (gar'an-sin), Garancine, the product obtained by treating pulverized madder, previously exhausted with water, with concentrated sulphuric acid at 100° Cent. (212° Fahr.), and again washing with water. The residue thus obtained is found to yield better results in dyeing than madder itself.

Garay (gā'rī), Janos, a Hungarian poet, born in 1812; studied at Pesth, where he held a minor post in the pubilc library. His heroic poem, *Csatár* (1834), was succeeded by a number of dramas, mostly historical, the chief being *Arbocz* (1837), *Országy Ilona* (1837), and *Bátory Erzsébet* (1840). His cycle of historical ballads, showing Uhland's influence, was published in 1847, under the title *Arpádok*, and his lyric poems, *Balatoni Kagylok* ('Shells from Lake Balaton'), in 1843. His last work was a historical epic, *Szent László* ('St. Ladislaus'), published 1850. He died in 1853. His *Life* was published by Ferenczy in 1883.

Garbage (gar'bij), Disposal of. Various methods are in use for the disposal of garbage, or the kitchen refuse: feeding to swine; burying in the ground; cremation and reduction. European and particularly British practice is to mix in one common receptacle all classes of refuse—ashes, tin cans, garbage, etc.—but in the United States garbage is usually separated from other waste. Burning or cremation is generally practiced; but in large cities the reduction process has proved most satisfactory. St. Louis, St. Paul, and Denver estab-

lished reduction plants in 1889, Philadelphia in 1894 and New York in 1896. The garbage is removed to the reduction works, where the grease is extracted and the remaining material made into a fertilizer base. The garbage is placed in large air-tight cylinders and steamed or treated with a light solvent. The grease and water are drawn off, and the grease, after it has risen to the top, offered for sale. The remaining material is pressed and dried and sold to fertilizer manufacturers, or mixed with the proper materials to make a commercial fertilizer.

Garbler (gar'bler), formerly an officer of the city of London, vested with power to enter any shop, warehouse, etc., to examine drugs and spices, and garble (*i.e.* sift out the coarse parts, dirt, etc.), and make clean the same or see that it was done.

Garcia (gar'si-a), CALIXTO, a Cuban patriot, born at Holguin, Cuba, in 1836; died in 1898. He aided in the revolt of 1868, both with money and in person, displaying such military ability that he was made a major-general of the patriot forces. In 1873, being surprised by the Spanish troops, he fought till all hope of escape vanished, then sought to kill himself, shooting himself in the head. Recovering from his nearly fatal wound, he was sent to Spain and imprisoned until after the peace of 1878. In 1895 he again joined in the patriot outbreak, and continued in it until freedom was won by American aid, in 1898.

Garcilaso de la Vega (går-thē-lä'-sō; properly *Garcias Laso de la Vega*), called the *prince of Spanish poets*, born at Toledo, in 1500 or 1503. He went in his youth to the Spanish court, and in 1529 distinguished himself in the Spanish corps serving against the Turks in Austria. An intrigue with a lady of the court led to his imprisonment on an island in the Danube, where several of his poems were composed. He was subsequently engaged in the expedition against Soliman, and in that against Tunis. He was made commander of thirty companies of infantry in 1536, and accompanied the imperial army against Marseilles, but was mortally wounded in attempting to scale a tower near Fréjus. He died at Nice in that year, and was buried at Toledo. His name is associated with that of his contemporary Boscan in the impetus given to Spanish literature by the imitation of the Italian poetic style as exemplified in Petrarch, Ariosto, and Sannazaro. His works, which consist of eclogues, epistles, odes, songs, sonnets, etc., are considered very graceful and musical.

Garcilaso de la Vega, or GARCIAS LASO DE LA VEGA, historian of Peru, surnamed the Inca, son of Garcilaso de la Vega, one of the conquerors of Peru, and a princess of the race of the Incas; born at Cuzco, Peru, in 1530 or 1540. Having fallen under the groundless suspicion of the Spanish government, he was sent home in 1560, and died in 1616 or 1620. His great work on the history of Peru is in two parts: the first entitled *Los Comentarios Reales que tratan del Origen de los Incas*, etc. (Lisbon, 1609); the second, the *Historia general del Peru* (Cordova, 1616). He wrote also *Historia de la Florida* (Lisbon, 1609).

Garcinia (går-sin'i-a), the genus of plants to which the mangosteen and gamboge belong, of the nat. order Guttiferæ.

Gard (går), a department of Southern France, abutting on the Gulf of Lyons; area, 2256 square miles. The north and west are occupied by the Cevennes and their branches, sloping gradually into a fertile plain, the coastline of which is so low as to form extensive swamps and salines. The drainage belongs partly to the Garonne, but chiefly to the Rhone, which forms the east boundary. Within the department the chief river is the Gard. The rich lower districts produce a large quantity of wine, and are noted for silk culture. Large quantities of salt are made; and lead, coal, iron, etc., are worked. There are silk, woolen, and cotton manufactures. Nîmes is the capital. Pop. 421,166.

Gard, PONT DU, a fine Roman aqueduct, in Gard, 10 miles from Nîmes, joining two mountains and passing over the Gardon. It has three tiers of arches, and is 160 ft. high. See *Aqueduct*.

Garda (går'dȧ), or BENA'CO, LAKE (Ital. *Lago di Garda;* the *Benācus Lacus* of the Romans), the largest lake in North Italy, belonging to the Alpine region, between Lombardy and Venice, 33 miles long, north to south, 3 to 11 miles broad, greatest depth 902 ft., 213 ft. above sea level. The Sarca, almost its only affluent, enters at its north end, and it is drained by the Mincio, which issues from its southeast end, near Peschiera. It is well stocked with fish. Steamboats ply on it, and its shores are covered with villas.

Gardaya (går-dä'yȧ), or GHARDAYA, a town of Algeria, in the Sahara, surrounded by a wall flanked

with towers and entered by ten gates. Pop. about 8000.

Garde Ecossaise (gärd ā-kos-āz), the Scotch guard in the service of the kings of France, first instituted on a regular footing by Charles VII, who in 1453 selected a hundred Scotch archers to form a special bodyguard in recognition of the service of the Scotch soldiery in the Hundred Years' war. There was also another company of a hundred Scots placed at the head of a regular army of fifteen companies of 100 lances each, which was organized. This body was commanded by Scotchmen of the highest rank. James VI, and his sons Henry and Charles, and James II when Duke of York, held in succession the rank of captain in it.

Gardelegen (gär'de-lā-gen), a town of Prussia, gov. of Magdeburg. Pop. 8193.

Garde Nationale (nā-syo-nāl), a guard of armed citizens instituted at Paris, July 13, 1789, for the purpose of preserving order and protecting liberty. At first it numbered 48,000 men, but was increased to 300,000 when it was organized throughout the whole country. Acting as a royalist and reactionary force, it was crushed by Napoleon in 1795. It was reorganized by the Directory and by Napoleon, and again under the Bourbons, to whom, however, it was a source of such disquietude that it was dissolved by a royal ordinance in 1827. Under Louis Philippe it was resuscitated in its old form, and contributed to his overthrow. In 1851 the national guard was again reorganized, but in 1855 it was dissolved. In 1870 the national guard of Paris was again formed for the defense of the city against the Prussians. The resistance of a section of the guard to the decree of disarmament issued under M. Thiers led to the communal war, at the close of which the guard was declared dissolved by the National Assembly (1871).

Garde Nationale Mobile, a body constituted by Napoleon III in 1868, on the suggestion of Marshal Niel, to form bases of regiments to supplement the regular army. It was called into action in 1870-1871, but was too ill organized to be efficient.

Garden City, a village on Long Island, New York, 18 miles E. of New York City. It is a fashionable summer resort, but is chiefly notable for the Gothic Cathedral of the Incarnation, erected in memory of Alexander S. Stewart by his widow. Permanent population about 1000.

Gardenia (gar-dē'ni-a), a genus of trees and shrubs, nat. order Cinchonaceæ, natives of tropical Asia and Africa, bearing beautiful white or yellowish flowers of great fragrance. The genus was named after Dr. Garden, of Charleston, South Carolina.

Gardening. See *Horticulture.*

Garden of the Gods, the name given a remarkable locality in Colorado, near Colorado Springs, notable for the beautiful and fantastic forms taken by its eroded red and white sandstone rocks. The entrance passes through a 'Gateway' formed by bright red rocks 300 feet high. The locality, 500 acres in area, has been converted into a national park.

Garden-spider, also called Diadem or Cross-spider, the *Epeira diadēma*, a common European spider, the dorsal surface of which is marked with a triple yellow cross. It forms a beautiful geometric web.

Garden-warbler (*Sylvia* or *Curruca hortensis*), a migratory song-bird visiting Northern Europe from the end of April to September, and ranking next to the blackcap as a songster. It is rather less than 6 inches long, the head, back, neck, wings, and tail being a greenish brown, the whole under surface of the body a dull brownish white.

Gardes Suisses (gärd swēs), a body of guards under the French kings. Swiss companies served in France from the time of Louis XI, but the institution of the Swiss guards as a complete regiment dates from 1616. Both the officers and men were Swiss, and the companies mounted guard according to the rank of the cantons of their captains. The Swiss guards followed in order of precedence after the French guards, enjoyed liberty of worship, and were exempted from service in Germany, Italy, and Spain. Their attachment to the king made them obnoxious to the people during the revolution, and during the defense of the Louvre in August, 1792, they were massacred without mercy.

Gardiner (gar'di-ner), SAMUEL RAWSON, historian, born at Ropley, in Hants, England, in 1829; died in 1902. He became professor of history at King's College, London. He wrote *The Thirty Years' War*, *Cromwell's Place in History*, and other historical works of much value.

Gardiner, STEPHEN, an English prelate, believed to have been a natural son of Lionel, bishop of Salisbury, and brother of Elizabeth

Woodville, queen of Edward IV. He was born in 1483 at Bury St. Edmunds, and in 1520 took the degrees of D.D. and LL.D. at Cambridge, where he became Master of Trinity Hall. He passed at this time by the name of Dr. Stephens. Having become secretary to Wolsey and a favorite with the king, he was despatched to Rome in 1528 to forward Henry VIII's divorce, and on his return was appointed secretary of state, and in succession archdeacon of Norwich and

Bishop Gardiner.

Leicester, and Bishop of Winchester. He also went on various embassies to France and Germany. He supported the king in renouncing the authority of the pope, but opposed the doctrines of the Reformation, and took an active part in the passing of the six articles and in the prosecution of Protestants. He was successful in contriving the fall of his opponent, Cromwell, but failed to injure Catherine Parr, and fell into disfavor. During the reign of Edward he was imprisoned in the Fleet, deprived of his bishopric, and afterwards imprisoned in the Tower from 1548-53, but Mary restored him to his bishopric, and appointed him lord chancellor. He officiated at her coronation and marriage, and became one of her chief advisers. He took an active part in the persecutions at the beginning of the reign, but was outdone in ferocity by Bonnar. He died in 1555.

Gardiner (g a r' d i - n e r), a city of Kennebec County, Maine, 7 miles S. of Augusta. It is on the west bank of the Kennebec River, which is navigable for large vessels to this place, and it is the headquarters of a large commerce in ice, also in lumber. It has saw and paper mills, door and sash factories and shoe industries. Pop. 6000.

Gardner (gard'ner), a village of Worcester county, Massachusetts, 15 miles W. of Fitchburg. Its principal industry is chairmaking. Pop. of town (township), 14,699.

Garfield, HARRY A., educator, lawyer, administrator, son of President Garfield, was born at Hiram, Ohio, in 1863. He practiced law in Cleveland, Ohio, became professor of contracts Western Reserve University Law School, 1891-97; professor of politics in Princeton University, 1903-08; and president of Williams College from 1908. He was appointed Fuel Administrator in 1917 by President Wilson.

Garfield (gar'fēld), JAMES ABRAM, an American general and statesman, the twentieth President of the United States, born at Orange, Ohio, in 1831, and worked on a farm till his 14th year. He acquired a good education, however, studied law, and in 1859 was elected to the Ohio state senate. In 1861 he entered the army, was appointed colonel, became chief of staff to Rosecrans, and major-general of volunteers. He resigned his command to enter Congress in 1863. He sat in nine congresses for the same constituency, serving on important committees, and winning ground no less by strong intelligence than uncompromising honesty. In 1880 he was elected to the Senate, and in the same year elected President of the United States. Many reforms seemed about to be inaugurated, when he was shot, July 2, 1881, by a disappointed office seeker named Guiteau in the railway station at Washington. He lingered eighty days, dying at Long Branch, September 19, 1881.

Garfield, JAMES RUDOLPH, son of the preceding, brother of Harry A. Garfield (*q. v.*), was born at Hiram, Ohio, in 1865. He was admitted to the bar in 1888, and was a member of the Ohio legislature, 1896-99. He was a member of the United States Civil Service Commission, was appointed commissioner of corporations, and Secretary of the Interior in the Roosevelt Cabinet, 1907-09.

Garfield, a borough of Bergen county, New Jersey, on the Passaic River, opposite Passaic. It has chemical works, woolen mills, etc. Pop. 10,213.

Garfish, SEA-PIKE, or GARPIKE (*Belŏne vulgaris*), a fish, known also as the *sea-needle*, making its appearance a short time before the mackerel in their annual visit for spawning. It is long and slender, sometimes 2 or 3 feet in length; the head projects forward into a very long, sharp snout; the sides and belly are of a bright silvery color, and the back green, marked with a dark pur-

ple line. The name garfish or garpike is also given to other species of *Belone*, and to a ganoid fish of the genus *Lepidosteus*, found in the fresh waters of America. See *Bony-pike*.

Garganey (gar'ga-ni; *Anas querquedula*), a species of duck called also 'summer teal,' from visiting Britain in summer and being closely akin to the teal. It is widely spread through the eastern hemisphere.

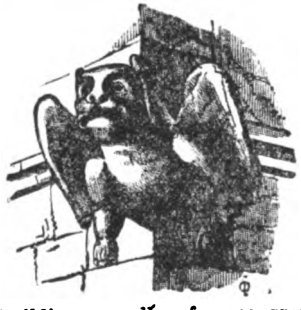
Gargano (gär-gä'nō; Latin, *Garganus*), a group of pine-clad mountains in South Italy, province of Foggia, forming the spur of the boot in the Italian peninsula projecting into the Adriatic. The loftiest summit is Calvo, 5450 feet.

Gargantua (gär-gan'tū-a), the hero of Rabelais's satire, so named from his father exclaiming '*Que grand tu as!*' 'How large (a gullet) thou hast!' on hearing him cry out, immediately on his birth, 'Drink, drink!' so lustily as to be heard over several districts. It required 900 ells of linen for the body of his shirt, and 200 more for the gussets, 1100 cowhides for the soles of his shoes, and he picked his teeth with an elephant's tusk.

Gargarrus (gär'ga-rus; Turkish, *Kasdagh*), the highest mountain of the ridge of Ida, in Asia Minor, near the Gulf of Adramyti, on the north.

Gargle (gär'gl), a liquid application to the throat. In using a gargle the head should be thrown well back so as to keep the liquid in contact with the throat, and by expelling the air from the lungs through the liquid the passage may be thoroughly washed. Care should be taken not to swallow the gargle.

Gargoyle (gär'goil), in Gothic architecture, a projecting spout, for throwing the water from the gutter



of a building, usually of some grotesque form, such as the head or figure of an animal or monster.

Garhmukhtesar. See *Gurmukteswar*.

Garhwal (gar-hwäl'), or GURHWAL, a district in the Northwest Provinces, India, bounded on the north by Tibet, east by Kumáun, south by Bijnaur district, and west by the Garhwal state; area, 5500 sq. miles; pop. 429,900. There are good roads, and a considerable trade with Tibet.

Garhwal, or TEHRI, a native Indian state under British protection, west of the district of the same name; area, 9180 sq. miles; pop. 268,885. Chief town, Tehri; chief river, the Alaknanda and other headwaters of the Ganges. It is situated in the Himalayas, which rise here to a height of over 20,000 feet. A large part is covered with forests, which include valuable *deodar* tracts, leased to the British government in 1864.

Garibaldi (gar-e-bäl'de), GIUSEPPE, an Italian patriot and hero, was born at Nice, 1807, his father being a poor fisherman. He got little education, and for a number of years was a

Giuseppe Garibaldi.

sailor on various trading vessels. In 1834 he became a member of the 'Young Italy' party, and being condemned to death for his share in the schemes of Mazzini, escaped to Marseilles, took service in the fleet of the Bey of Tunis, and finally went to South America. In the service of the Republic of Rio Grande against the Brazilians he became known as a brilliant leader, and with his famous Italian legion he subsequently gave the Montevideans such effective aid against Buenos Ayres as to earn the title of 'hero of Montevideo.' In 1848 he returned to Italy, raised a band of volunteers, and harassed the Austrians until the cessation of hostilities and re-establishment of

Austrian supremacy in Lombardy. He then retired to Switzerland, but in the spring of 1849 proceeded to Rome to support Mazzini's republic. He was appointed to command the forces, but the odds were overwhelming, and after a desperate defense of thirty days Garibaldi escaped from Rome with 4000 of his followers. In the course of his flight his wife Anita died from fatigue and privations. He reached the United States, and was for some years in command of a merchant vessel. He then purchased a part of the small island of Caprera, off the north coast of Sardinia, and made this his home for the rest of his life. The subscriptions of his admirers enabled him in time to become owner of the whole island. In the war of 1859, in which Sardinia recovered Lombardy, Garibaldi and his Chasseurs of the Alps did splendid service; and on the revolt of the Sicilians in 1860 he crossed to the island, wrested it after a fierce struggle from the King of Naples, recrossed to the mainland and occupied Naples, where he was proclaimed Dictator of the Two Sicilies. It was now feared that Garibaldi might prove untrue to his motto—Italy and Victor Emmanuel—but he readily acquiesced in the annexation of the Two Sicilies to Italy, and declining all honors, retired to his island farm. In 1862 he endeavored to force the Roman question to a solution, and entered Calabria with a small following, but was taken prisoner at Aspromonte by the royal troops. He was soon released, however, and returned to Caprera. In 1864 he received an enthusiastic welcome in Britain. In 1866 he commanded a volunteer force against the Austrians in the Italian Tyrol, but failed to accomplish anything of consequence. Next year he attempted the liberation of Rome, but near Mentana was defeated by the French and pontifical troops, and was again imprisoned by the Italian government, but soon pardoned and released. In 1870 he gave his services to the French republican government against the Germans, and with his 20,000 men rendered valuable assistance in the southeast. At the end of the war he was elected a member of the French assembly, but speedily resigned his seat and returned to Caprera. Rome now became the capital of united Italy, and here in January, 1875, Garibaldi took his seat in the Italian parliament. The latter part of his life was spent quietly at Caprera. After 1870 he wrote two or three novels—but these are very mediocre productions. He died somewhat suddenly in 1882. His autobiography has been published in English.

Gariep (ga-rēp'). See *Orange River.*

Garigliano (gâ-ril-yä'nō), a river of S. Italy, formed by the junction of the Liri and Sacco near l'ontecorvo. After a course of 40 miles it falls into the Gulf of Gaëta; but if the Liri is regarded as the same stream, its length is more than double.

Garland (gar'land), AUGUSTUS HILL, statesman, born near Covington, Tennessee, in 1832; died in 1899. He settled in Arkansas, was a member of the Confederate Congress, 1861-65, and was elected to the United States Senate in 1867, but not permitted to take his seat. He was elected Governor of Arkansas in 1874, and United States Senator in 1876 and 1883, and in 1885 was appointed by President Cleveland Attorney-General of the United States.

Garland, HAMLIN, author, born at West Salem, Wisconsin, in 1860. His first book, *Main Traveled Roads*, was published in 1890, and attracted attention by its delineation of the hardships of Western farm-life. Later works were *Prairie Folks*, *Her Mountain Lover*, *Tyranny of the Dark*, *The Long Trail*, *The Shadow World*, etc.

Garlic (gâr'lik; *Allium sativum*), a hardy, perennial allied to the onion, indigenous to the south of Europe, and forming a favorite condiment amongst several nations. The leaves are grass-like, and differ from those of the common onion in not being fistulous; the stem is about 2 feet high; the flowers are white; and the root is a compound bulb, consisting of several smaller bulbs, commonly denominated *cloves*, enveloped by a common membrane. It has a strong, penetrating odor, and a pungent, acrid taste. Used as a medicine, it is stimulant, tonic, and promotes digestion; it has also diuretic and sudorific qualities, and is a good expectorant.—*Oil of garlic* is a sulphide of allyl, $(C_3H_5)_2S$, a colorless, strongly-smelling oil, exceedingly irritant to the palate and the skin. It is contained also in the onion, leek, asafœtida, etc.

Garnet (gâr'net), a beautiful mineral, or group of minerals, classed among the gems, and occurring generally in mica-slate, hornblende-slate, gneiss, and granite, usually as more or less regular crystals of from twelve to sixty or even eighty-four sides. The prevailing color is red of various shades, but often brown, and sometimes green, yellow, or black. They vary considerably in composition, but admit of classification into three principal groups according to their chief sesquioxide basic

components, viz., alumina, iron, and chrome garnets. Among the varieties are common garnets, pyrope, alamandine, precious or oriental garnet, allochroite, melanite or black garnet, etc. By jewelers garnets are classed as Syrian, Bohemian, or Cinghalese, rather, however, from their relative value and fineness than as necessarily implying that they came from these places. The first, named after Syrian, in Pegu, long the chief mart for garnets, are the most esteemed, being a violet-purple unmixed with black and taking an orange tint by artificial light. The Bohemian garnet is usually a dull poppy red with hyacinth orange tint when held between the eye and the light; the pyrope is a full crimson form of this class. Coarse garnets reduced to powder are sometimes used in place of emery for polishing metals.

Garofalo (gȧ-rof'ȧ-lo), BENVENUTO, (properly *Benvenuto Tisio da Garofalo*), an Italian historical painter, born at Ferrara in 1481. He painted at Cremona and at Rome, where he became intimate with Raphael, and then returned to Ferrara, where he died blind in 1559. His works show the influence of the Lombard school and still more of Raphael, though it is denied that he was an imitator of the latter. Examples of his work are to be found in Ferrara, Florence, Rome, and London, and most of the leading galleries.

Garo Hills (gä'rō), a district of N. E. India, forming the southwestern corner of Assam; area, 3146 sq. miles. It is a mountainous and forest region intersected by tributaries of the Brahmaputra. The native Garos are a robust and active race. Among them the wife is regarded as the head of the family, and property descends through females. Pop. 110,000.

Garonne (gȧ-rōn; Lat. *Garumna*), a river of S. W. France, rising in the vale of Aran, in the Spanish Pyrenees; length, about 350 miles. It enters France and flows northwest to the Atlantic, through Haute-Garonne, Tarn-et-Garonne, Lot-et-Garonne, and Gironde. Below Toulouse it receives, on the left, the Save, Ratz, Gers, Baise, etc.; on the right, the Tarn, the Lot, and the Dordogne, on joining which, it changes its name to the Gironde. It is navigable on the descent from St. Martory, and both ways from Toulouse. The Canal du Midi, joining it at Toulouse, forms a communication between the Atlantic and the Mediterranean at Narbonne, and the Canal Latéral, from Toulouse to Castets-en-Dorthe (Gironde), supplements its direct navigation.

Garonne, HAUTE, a department of the south of France, one of the five separated by the Pyrenees from Spain. It is traversed from south to north by the higher reaches of the Garonne and for about 26 miles by the Canal du Midi. The valleys and the lower northern districts are often of great fertility, and cereals and wine are largely exported. Hemp, flax, oranges, and tobacco are also much grown. The principal mines are lead, copper, coal, antimony, iron, and zinc, and a fine marble is quarried. There is a large transit trade with Spain. Capital of department, Toulouse. Area, 2529 sq. miles. Pop. 448,481.

Garrick (gȧr'ik), DAVID, actor, born at Hereford, in 1716. His grandfather was a French refugee, his father a captain in the army. He was educated at Lichfield grammar school, spent a short time at Lisbon with an uncle, and returning to Lichfield was placed under Samuel Johnson, who was induced to accompany him to the metropolis (1736). Garrick then began to study for the law, but on the death of his father joined his brother Peter in the wine trade. He had, however, as a child a strong passion for acting, and in 1741 he joined Giffard's company at Ipswich under the name of Lyddal. At Giffard's theater in Goodman's-fields he achieved a great success as *Richard III*, and in 1742 was not less successful at Drury Lane. In 1745 he became joint manager with Mr. Sheridan of a theater in Dublin, and after a season at Covent Garden (1746) purchased Drury Lane in conjunction with Mr. Lacy, opening it 15th September, 1747, with the *Merchant of Venice*, to which Dr. Johnson furnished a prologue. From this period may be dated a comparative revival of Shakespere, and a reform both in the conduct and license of the drama. In 1763 he visited the Continent for a year and a half. He had already written his farces of *The Lying Valet*, *Lethe*, and *Miss in her Teens*; and in 1766 he composed, jointly with Colman, the excellent comedy of *The Clandestine Marriage*. After the death of Lacy, in 1773, the sole management of the theater devolved upon Garrick, until 1776, when he sold his moiety of the theater for £37,000, performed his last part, *Don Felix* in *The Wonder*, for the benefit of the theatrical fund, and bade an impressive farewell to the stage. He died in 1779, and was buried with great pomp in Westminster Abbey. Besides the pieces mentioned he wrote some epigrams, a number of prologues and epi-

logues, and a few dramatic interludes. He left a large fortune.

Garrison (gar'i-son), a body of troops stationed in a fortified place (fort, town, or castle) to defend it or keep the inhabitants in subjection.

Garrison, LINDLEY M., American cabinet officer, born in Camden, N. J., November 28, 1864. Educated at Harvard and the University of Pennsylvania. Admitted to the Philadelphia bar in 1886. Vice-chancellor of New Jersey, 1904–1913. In 1913 he entered President Wilson's cabinet as secretary of war.

Garrison, WILLIAM LLOYD, an American journalist and founder of the anti-slavery movement in the United States, born in 1805. He was apprenticed to a shoemaker, but eventually became a compositor on the *Newburyport Herald*. In 1827 he became editor of the *National Philanthropist*, the first American temperance journal. With Mr. Lundy, a Quaker, he then started in Baltimore the paper called the *Genius of Universal Emancipation* (1829), his denunciations of slave-traders leading to his imprisonment for libel. On his release he commenced lecturing in Boston, started the *Liberator* (1831), published weekly with the aid of one assistant and a negro boy. In 1832 appeared his *Thoughts on African Colonization*, and in the same year he established the American Anti-Slavery Society. He subsequently visited Enland, where he was welcomed by Wilberforce, Brougham, Buxton, and others. In 1835 he was saved with difficulty from a Boston mob; but his principles made steady progress until 1865, when the Anti-Slavery Society was dissolved with its work accomplished. He died at New York, 1879. A volume of sonnets (1843) and one of selections (1852) bear his name.

Garrot (gar'ot), a duck of the genus *Clangula*, of the oceanic section of the duck family, widely distributed over the temperate regions of Europe and America. They breed in the northern countries, returning to the more temperate regions in winter. The golden-eyed garrot (*C. chrysophthalmus*), and the harlequin garrot (*Clangula histrionica*) are common European species.

Garrote (gar-ōt'), a mode of punishment in Spain by strangulation, the victim being placed on a stool with a post or stake (Spanish, *garrote*) behind, to which is affixed an iron collar with a screw; this collar is made to clasp the neck of the criminal, and the screw is turned until its point enters the spinal cord, where it unites with the brain, causing instantaneous death. This word, with the French spelling and pronunciation *garrotte*, has become naturalized in Great Britain and the United States as a term for a species of robbery effected by throttling the victim and stripping him while insensible.

Garrow Hills. See *Garo Hills*.

Garrulus (gar'ū-lus), a genus of insessorial birds of the crow family, containing the jays.

Garrya (gar'ri-a), a genus of opposite-leaved evergreen shrubs, natives of California, Mexico, Cuba, and Jamaica. *G. elliptica* is a handsome garden plant with long, drooping, necklace-like catkins of pale yellow flowers.

Garter (gar'ter), ORDER OF THE, the highest and most ancient order of knighthood in Great Britain. The origin of the order, though sometimes assigned to Richard I, is generally attributed to Edward III, the legend being that the Countess of Salisbury having dropped her garter while dancing, the king restored it, after putting it round his own leg, with the words, which became the motto of the order, '*Honi soit qui mal y pense*' (Shame be to him who thinks evil of it). The date of the foundation or restoration by Edward III of the order, as given by Froissart, is 1344, while other authorities, founding on the statutes of the order, assign it to 1350. The statutes of the order have been repeatedly revised, more particularly in the reigns of Henry V, Henry VIII, Edward VI, and George III—the last in 1805. Ladies are said to have been admitted up till the reign of Edward VI. The common title of the order was the Order of St. George, and it still bears this title, as well as that of the Garter. The original number of knights was twenty-six, including the sovereign, who was its permanent head; and this number is still retained, except that by a statute passed in 1786 princes of the blood are admitted as supernumerary members.

Insignia of the Garter.

The peculiar emblem of the order, the garter (5), a dark-blue ribbon edged with gold, bearing the motto and with a gold buckle and pendant, is worn on the left leg below the knee. The mantle is of blue velvet, lined with white taffeta, the surcoat and hood of crimson velvet, the hat of black velvet, with plume of white ostrich feathers, having in the center a tuft of black heron's feathers. The collar of gold (3), which consists of twenty-six pieces, each in the form of a garter, has the badge of the order, called the George (4), pendent from it. This consists of a figure of St. George on horseback fighting the dragon. The lesser George (2) is worn on a broad blue ribbon over the left shoulder. The star (1), formerly only a cross, is of silver, and consists of eight points, with the cross of St. George in the center, encircled by the garter. A star is worn by the knights on the left side when not in the dress of the order. The officers of the order are the prelate, the Bishop of Winchester; the chancellor, the Bishop of Oxford; the registrar, Dean of Windsor; the garter king of arms and the usher of the black rod. There are a dean and twelve canons, and each knight has a knight-pensioner.

Garter-fish. See *Scabbard-fish.*

Garter Snake, a non-poisonous serpent of the genus *Thamnophis*, widely distributed on the American continent from Southern Canada to Central America. It is a small reptile, a specimen a yard long and an inch in greatest diameter being considered a large one. The garter snake inhabits swamps, woods and rocky fields, and lives on worms, frogs, fish, small mammals and birds. Some species are semi-aquatic. The common color marking of the garter snake is three light-colored longitudinal stripes on a darker ground, and slate-colored ventral surface.

Gary (gar'i), an industrial city in Lake county, Indiana, founded in 1906 on the shore of Lake Michigan, a few miles S. E. of Chicago, as the seat of an immense plant of the Indiana Steel Company, an outgrowth of the U. S. Steel Corporation. It was named from Elbert H. Gary, an eminent corporation lawyer, born at Wheaton, Illinois, in 1846, and president in 1898 of the Federal Steel Company, which was merged into the U. S. Steel Corporation in 1901, of which he was made chairman of the Board of Directors. The town quickly gained a large population, amounting in 1910 to 16,802.

Gary School System, a method of literary and mechanical education which has been adopted in the industrial city of Gary, Indiana. It is a 'study, work and play school,' all provided for in the same building, in such a way that the full capacity of the school rooms, workshops, gymnasium and playground are successively occupied by the several classes. There are no fixed courses or set textbooks, each child being free to select the studies and work he prefers. There is also no division into elementary and high schools, all these being in the same building and using the same school rooms, shops, etc.

Gas, an elastic aeriform fluid, a term originally synonymous with air, but afterwards restricted to such bodies as were supposed to be incapable of being reduced to a liquid or solid state. Under this supposition gas was 'a term applied to all permanently elastic fluids or airs differing from common air.' After the liquefaction of gases by Faraday, the old distinction between gas and vapor, viz., that the latter could be reduced to a liquid or solid condition by reduction of temperature and increase of pressure, while a gas could not be so altered, was no longer tenable, so that the term has resumed nearly its original signification, and designates any substance in an elastic aeriform state. *Gases* are distinguished from *liquids* by the name of *elastic* fluids; while liquids are termed *non-elastic*, because they have, comparatively, no elasticity. But the most prominent distinction is the following:—*Liquids* are compressible to a small degree, and expand into their former state when the pressure is removed; and in so far they are elastic, but *gases* appear to be in a continued state of compression, for when left unconfined they expand in every direction to an extent which has not hitherto been determined. In respect of this indefinite expansiveness, all gaseous bodies obey more or less strictly two laws, commonly called the 'gaseous laws.' The first, known as the law of Boyle and Mariotte, given first by Robert Boyle in 1662, and then by Mariotte in 1676, is that—*The volume of a given mass of gas varies inversely with the pressure to which the gas is subjected*: or, in other words, the *density* of a given mass of gas is in direct proportion to the pressure that the gas is subjected to. The second of the gaseous laws is commonly called the law of Dalton and Gay-Lussac. It is, however, properly called Charles's law. Dalton published it in 1801: but Gay-Lussac, who stated it in 1802, gives the credit of having discovered it, fifteen years previously, to

Citizen Charles. The law may be stated as follows:—*The volume of a gas maintained under constant pressure increases for equal increments of temperature by a constant fraction of its original volume;* and this fraction is the same whatever is the nature of the gas. A mass of gas, whose volume is 1000 at 0° C., becomes, at 100° C., 1366.5, the pressure remaining constant. In virtue of these laws a gas may now be defined to be a substance possessing the condition of perfect fluid elasticity, and presenting under a constant pressure a uniform state of expansion for equal increments of temperature—a property distinguishing it from vapor. There is, however, no known gas that obeys these two laws perfectly; thus, of the gases whose liquefaction has been attended with most difficulty (oxygen, hydrogen, nitrogen, carbonic oxide, nitric oxide, carburetted hydrogen and helium), all except hydrogen are more compressible than they should be theoretically, while hydrogen deviates slightly in the opposite direction, being less compressible than Boyle's law would indicate. The other gases exhibit even greater deviations from Boyle's law, and the amount of the deviation rapidly increases as the gas is brought nearer and nearer to liquefaction. The law of Dalton or Charles which gives for equal elevations of temperature equal increments of volume is also deviated from by every gas, and more and more so as the point of liquefaction is approached.

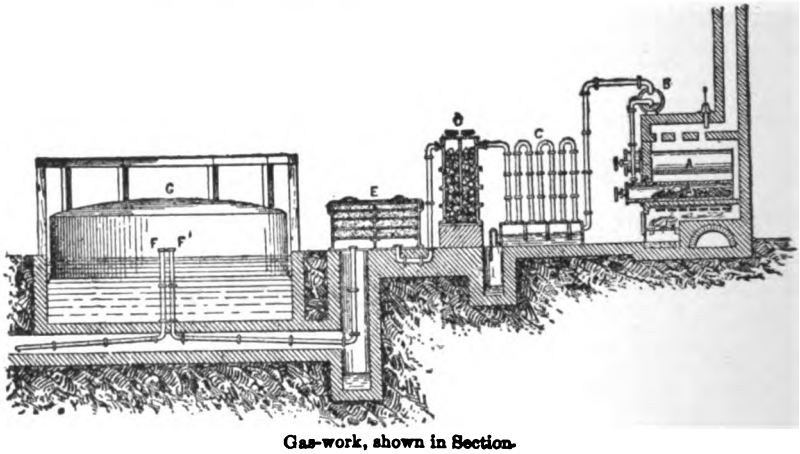
The liquefaction of gases is effected by the application of cold or pressure, or both combined. For any given pressure there is a particular temperature at which the gas liquefies. At a certain point, however, called by Andrews the *critical point of temperature*, the distinction between liquid and gas appears completely lost. At and above this temperature no pressure that can be applied will convert the fluid into the form of a liquid even though the volume is diminished by pressure so much as to make the density of the fluid greater than that of the liquid obtained at lower temperatures. By 1908 all gases had been liquefied, including the extremely rare hydrogen and helium.

The power of motion inherent in all parts of aeriform matter is accounted for by the kinetic theory of gases, according to which a gas consists of an enormous number of molecules moving about with very great velocity. Great as is their number, however, the molecules are sparsely distributed through space, in comparison with their distribution when the substance is in the solid or liquid condition. A molecule of a gas flying about moves on in a straight line till it meets another molecule, or till it impinges on a side of the containing vessel. Meeting another molecule the two turn each other aside, just as two billiard balls when they come into collision are both deflected from their previous paths. Passing thence each flies on in a straight line till it meets another molecule, and each is again deflected. When the molecules impinge on the side of the vessel that contains the gas they rebound as a billiard ball does from the cushion of the billiard table; and the perpetual shower of molecules that strike and rebound from the sides gives rise to the phenomenon of gaseous pressure, just as an umbrella held out in a hailstorm is pressed downwards owing to the numerous impulsive blows that act upon it. When the temperature of a gas is raised the energy of the molecules is increased. They strike with greater velocity, and the number of blows on the side of the vessel is also increased. The pressure is therefore greater; and the law of Dalton or Charles is easily shown to be a consequence of the kinetic theory. Boyle's law also follows very simply from it; for if we diminish the volume of the containing vessel to one-half, one-third, or to any other fraction of its original volume, we increase the number of molecules in a given space, a cubic inch for instance, in the same ratio. Consequently, the number of impacts on a square inch of the surface of the containing vessel will also be increased in the same ratio, and the pressure will thus be increased in that ratio, too. It is estimated that in a cubic centimeter of gas at standard temperature and pressure there are nineteen million million million molecules.

Gas, LIGHTING BY, as ordinarily understood, the application of carburetted and bicarburetted hydrogen gas, that is *olefiant gas*, to the lighting of buildings, streets, etc. In 1739 the Rev. Mr. Clayton published a paper in the *Philosophical Transactions*, on the inflammable nature of the gases obtained by the decomposition of pit-coal in heated close vessels; but no practical application of this discovery was made before 1792, when Mr. W. Murdoch, a native of Ayrshire, in the employ of Messrs. Watt and Boulton, lighted his own house and offices at Redruth on this principle. In 1798 he erected a gas apparatus on a large scale at Soho Foundry, Birmingham, and in 1802 M. Le Bon lighted his house in Paris by gas, and made a proposal to supply the whole city. The introduction of gas for public lighting was,

however, strongly resisted, through fear of possible explosion, it being first tried in the streets in London in 1813. In the United States the resistance continued longer, Boston adopting it in 1822, New York in 1827 and Philadelphia in 1835. From this time coal gas became the most common illuminating agent wherever it could be prepared economically. Another kind of gas for lighting has lately come into use to some extent, namely, *water-gas*, produced from the decomposition of water in the form of steam by passing it through incandescent fuel. Gas for lighting, however, has been to a large extent superseded by electricity. See *Water-gas*.

Gas is obtained from coal, the best sorts being those bituminous coals known in England by the name of *cannel*, and



Gas-work, shown in Section.

in Scotland by the name of *parrot*. The coal is distilled in retorts of cast-iron (A), or now more generally of fire-clay, heated to a bright-red heat. As they issue from the retort into the hydraulic main (B) the products of distillation contain vapors of tar and naphtha, together with steam impregnated with carbonate of ammonia and hydrosulphide of ammonium. These vapors would condense in the pipes in which the gas must be distributed, and would clog them up; they must therefore be so far removed by previous cooling as to cause no inconvenient condensation at ordinary temperatures. The crude gas contains, besides, sulphuretted hydrogen, the combustion of which would exhale an offensive odor. Carbonic acid weakens the illuminating power of the gas, and has also to be removed. In the hydraulic main—a large horizontal pipe at first about half-filled with water—some separation is effected between the liquid products of distillation and the gaseous, which bubble up through the liquid into the upper portion of the main. At the end of the main the liquids fall by their greater gravity into the sunk reservoir known as the tar-well, while the gas is conducted to the condenser or refrigerator (C), a series of bent iron tubes kept cool either by exposure to currents of air or by allowing water to flow over them. In these there is a further deposit of tar and water, and the gas passes on to the washer, a series of cells in which the gas is forced through water or exposed to water spray for the removal of ammonia. The scrubber (D), which is sometimes used in place of the washer, is a large chamber filled with coke kept constantly wet with sprays of water. The gas in passing up the scrubber leaves its last traces of ammonia and its compounds, and then enters the purifiers (E), which are iron chambers containing a series of perforated trays on which are spread slaked lime (in the form of dry hydrate), or a mixture of sawdust and oxide of iron. These remove carbonic acid and the greater portion of the sulphur compounds, and the gas is then conveyed by means of a pipe (F') to the gas-holder (G), a storehouse or reservoir, in which it is subjected to uniform pressure, and from which it is discharged (F) into the street or other mains in the constant stream necessary to produce a steady flame from the burners in the houses of those using it. The

gas-holder, sometimes called a *gasometer*, is usually a very large cylindrical air-tight structure of iron plates, closed at top, open below, and having the lower end immersed in a water reservoir. It is supported by chains passing over pulleys on iron columns, the greater part of the weight of the gas-holder being counterbalanced by weights attached to the chains, so that it can exercise a certain regulated pressure on the gas contained in it.

The quantity of gas consumed by each consumer is measured by an instrument called a meter, of which there are two classes—the wet and the dry. The wet meter is composed of an outer box about three-fifths filled with water. Within this is a revolving four-chambered drum, each chamber being capable of containing a definite quantity of gas, which is admitted through a pipe in the center of the meter, and, owing to the arrangement of the partitions of the chambers, causes the drum to maintain a constant revolution. This sets in motion a train of wheels carrying the hands over the dials which mark the quantity of gas consumed. The dry meter consists of two or three chambers, each divided by a flexible partition or diaphragm, by the motion of which the capacity on one side is diminished while that on the other is increased. By means of slide-valves, like those of a steam engine, worked by the movement of the diaphragms, the gas to be measured passes alternately in and out of each space. The contractions and expansions set in motion the clockwork which marks the rate of consumption. The diaphragms in all the chambers are so connected that they move in concert.

The profitable consumption of gas, whereby the strongest light can be had at the least expenditure of gas, depends considerably upon the form of the burner, and the mode by which the flame is fed with the air necessary for its combustion. There must be a sufficient supply of oxygen to convert the carbon of the gas into carbonic acid, and the hydrogen into water. If oxygen is lacking, the flame will be smoky from excess of carbon. In this case the remedy is either to reduce the supply of gas or increase the supply of air. This may be effected by modifying the form of the burner, or in the case of the Argand burner by having a different shape of glass chimney. As to the form of the burner, it has been found that a plain jet ¼ inch in diameter at the orifice, will not give a flame free from smoke of a greater height than 2½ inches; but the same quantity of gas which would give a smoky flame from a plain jet, will produce a clear bright flame by extending or dividing the aperture of the jet so as to expose larger surface of flame to the atmosphere. It is not, however, necessary to increase the superficial area of the flame; it may even be diminished with a more intensely luminous effect by having instead of one aperture two small ones placed at an angle to each other, so that the jets may cross each other. This forms the union jet. Another form is the slit or batwing burner, in which a clean slit is cut across the top of the beak. In the Argand burner a circle of small holes supplies the gas, and a current of air is admitted through the center of the flame, which is steadied and considerably increased in brilliancy by being surrounded by a glass chimney. For the lighting of large halls an improvement called the sun-light has been introduced. This consists of rings of union jets. The incandescent gas light is produced by the heat from a bunsen burner making incandescent a fragile *mantle* of certain rare metals of great resisting powers to heat, which yield an intense light when heated. This is known as the Welsbach light. See *Natural gas*, *Producer gas*, *Acetylene gas*.

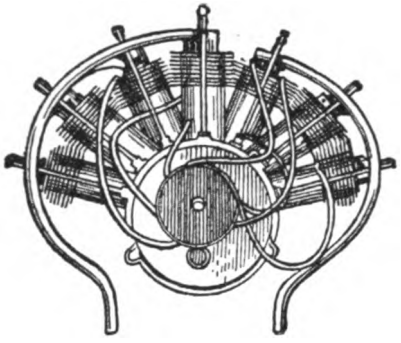
Gascoigne (gas-koin'), George, an English poet, born in 1535, educated at Cambridge, admitted to Gray's Inn in 1555. Being disinherited by his father, he served with distinction in Holland and was made prisoner by the Spaniards, but returned safely to England, and died at Stamford in 1577. He is chiefly remembered for his blank-verse satire, *The Steele Glas* (1576), and the *Complaynt of Philomene*, a rhyming elegy (1576), but he wrote two or three comedies and tragedies.

Gascoigne, Sir William, an English judge of the Court of King's Bench, born about 1350; died in 1419. He is chiefly famous for directing the imprisonment of the Prince of Wales (afterwards Henry V), who had struck him in open court for condemning one of his dissolute friends. He also declined to obey the king and sentence Archbishop Scroop to death, alleging that the law gave him no power over the life of an ecclesiastic. In each case the king ultimately approved his action.

Gascony (gas'kō-ni), an old division of France, between the Garonne, the sea, and the Pyrenees. It composes the departments of Hautes Pyrénées, Gers, and Landes, with part of those of Bas Pyrénées, Haute Garonne, Lot-et-Garonne, and Tarn-et-Garonne. The Gascons, who are of mixed Basque and Gothic descent, used to have

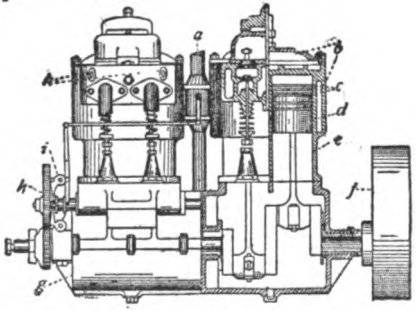
the character of being brave, faithful, and peculiarly tenacious of purpose, but much given to boasting, whence the word *gasconnade*.

Gas Engine, The term 'gas engine' is now generally used to cover all types of heat engines in which the power is derived from the combustion of a mixture of air with a gaseous, liquid or pulverized solid fuel, *within* the



R. E. P. Aeroplane Motor.

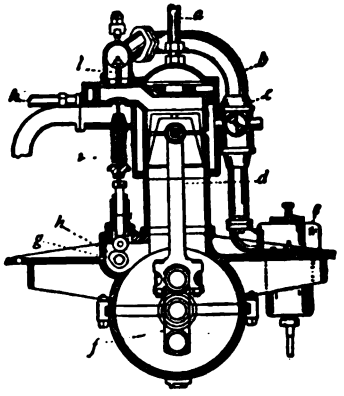
cylinder of the engine. The term 'internal combustion engine' is also properly applied to this class to distinguish it from steam or hot air engines, where the heat which energizes the working substance, such as steam or air, is generated in an external furnace. The fuels most commonly used in gas engines are coal gas, water gas, natural gas, producer gas, blast furnace gas, gasoline, naptha benzine, kerosene, fuel oil, crude petroleum, alcohol, oil tar, and in some instances powdered coal.



INTERNAL-COMBUSTION ENGINE (SIDE VIEW).

a, inlet for fuel mixture; *b*, water-jacket; *c*, piston rings; *d*, piston; *e*, cylinder; *f*, fly-wheel; *g*, crank-case; *h*, half-time gear; *i*, governor; *k*, holes for spark-plugs.

The earliest gas engines, which attempted to use the explosive force of gunpowder, were made by Huyghens in 1670



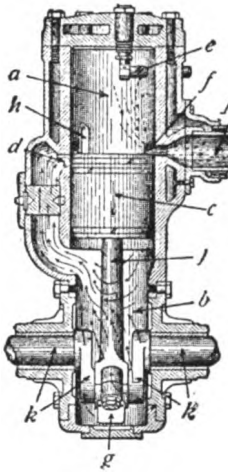
INTERNAL-COMBUSTION ENGINE (SECTIONAL VIEW).

a, water-outlet; *b*, vapor-pipe; *c*, throttle-valve; *d*, connecting-rod; *e*, carburetor; *f*, crank-shaft; *g*, cam-shaft: *h*, cam; *i*, exhaust-valve; *k*, water-inlet; *l*, induction-valve.

and Abbé Hautefeuille in 1682. In 1791 John Barker patented in England a gas turbine, and in 1794 Robert Street patented an oil engine in which the oil was first evaporated in the cylinder and then ignited. Following Lebon's design of 1799, several experimental engines for coal gas were developed between 1823 and 1842, but it was not until 1860 that a commercial engine was built by Lenoir. In this engine the gas and air were drawn into the cylinder in the first portion of the stroke; the slide valve then closed and the charge was ignited. Many Lenoir engines were used, in spite of the high gas consumption of 100 cubic feet per horse-power hour.

In Otto and Langen's 'free piston' engine of 1867 the weighted piston flew upward after the explosion, and turned the shaft on the return stroke by means of a ratchet gear. The consumption of gas was about 57 cubic feet per horse-power hour, but the engine was very noisy. In 1876 Dr. Otto brought out the first engine of the 'four-cycle' type, working on a principle suggested independently by Beau de Rochas in 1862. This is literally a 'four-stroke-cycle,' requiring two revolutions of the crank-shaft per power stroke, as follows: 1-out stroke, suction of charge; 2-return-stroke, compression of charge; 3-out stroke, explosion or power stroke; 4-

return stroke, exhaust and scavenging. The inlet valve is open on the first stroke, and the exhaust valve on the fourth. The compression of the gas before ignition gave much greater economy,



TWO CYCLE ENGINE.

a, working-end of cylinder; *b*, enclosed crank-case filled with slightly compressed aspirated and combustible mixture of air and gasified fuel; *c*, working-piston; *d*, inlet-port for mixture from crank-case; *e*, igniter, or spark-plug; *f*, *f*, exhaust-port and -pipe; *g*, inlet for air and fuel; *h*, deflector to prevent inlet mixture from crossing over to exhaust-port before the piston has closed the latter on its return stroke; *j*, connecting-rod; *k*, crank and crank-shaft.

reducing the consumption to 20 cu. ft. per horse-power hour. In 1881 Clerk devised a two-cycle engine, receiving an impulse every revolution, in which the exhaust took place at the outer end of the first stroke, and the fresh charge was at once pushed in by a separate 'displacer piston' or pump. Modern two-cycle engines of small sizes make use of a closed crank case instead of the displacer cylinder. The first successful American engine was the Brayton in 1873.

Six-cycle engines, compound engines and a four-cycle engine with alternate strokes of different lengths have been built, as also various types of gas turbines.

The Lenoir engine was double-acting. The first Otto engine was single-acting, *i.e.* received impulses only on one side of the piston, and while two- and four-cycle engines are now made both single- and double-acting, by far the commonest type being the single-acting, with a long trunk piston.

In 1893 Dr. Rudolf Diesel patented an engine in which air alone was compressed to a pressure of about 500 lbs. per sq. in., reaching a temperature of about 1000° F. The fuel was then injected into the cylinder in the form of a spray, and ignited spontaneously in the heated air. The efficiency of the Diesel engine is high; it can use low grades of fuel, but has the disadvantage of greater weight per horse-power. Diesel engines are made both 2- and 4-cycle, single- and double acting. One of the most interesting modern developments of the gas engine is the growing use of Diesel engines for marine propulsion.

Gas engines require that their cylinders shall be cooled. In small engines, and in some automobile and most aeronautic motors, air cooling is accomplished by providing the cylinders with radiating flanges, fins or pins, and a fan is generally employed. In most stationary engines, a water jacket is used. In automobiles the water is circulated by a pump or by thermal syphon, cooled in a radiator and used over. In some engines the water is simply allowed to boil, and the latent heat or evaporation absorbs the heat from the cylinder.

Ignition of the charge is most commonly effected by an electric spark, or by a hot tube or flame uncovered at the proper instant. The two general types of electric ignition are the jump-spark or high tension, and the make-and-break spark, or low tension.

Engines using fixed gases are arranged either with a mixing valve for proportioning the air and gas, or with separate inlet valves for each. Engines using volatile hydrocarbons, as gasoline, benzine, alcohol, etc., are equipped with some form of carburetor for vaporizing the liquid and mixing it with the entering air. With kerosene and heavier oils some form of pre-heating or volatilization is commonly practiced, or else the oil is injected into the cylinder. Some engines will run on kerosene if started first on a more volatile oil. Heavy tars and even powdered coal can be injected into the cylinder.

The valves of the gas engine were at first of the flat slide type, but higher pressures brought the general use of the mushroom-shaped poppet-valve actuated by a cam-shaft. A modern development is the cylindrical sleeve type, consisting of one or two sleeves riding concentrically on the cylinder and actuated by eccentrics. A great advantage in the elimination of noise and wear is claimed

for this form. In two-cycle engines, so called 'valveless,' the valves take the form of ports uncovered by the piston in its travel.

Gas-engine governors are divided into two general classes, the throttling type which varies the quantity of the explosive mixture admitted to the cylinder, and the "hit or miss" which varies the frequency of the impulse strokes by omitting to ignite the charge in the cylinder whenever the engine rises above a certain given speed.

The various types of engines have all been tried in different fields, but some idea of the commoner tendencies are here given:

Stationary engines—smaller powers, mostly 4-cycle horizontal, single-cylinder, and vertical one- to four-cylinder, single acting.

Stationary engines—large powers, horizontal, double-acting, frequently two-cycle. Built in all sizes up to 6,000 horsepower.

Portable engines—small two- and four-cycle gasoline engines, one- and two-cylinder, vertical and horizontal, single-acting.

Automobile engines—mostly four-, six- and eight-cylinder, vertical four-cycle, single-acting engines; a few two-cycle.

Marine engines—small, for motor boats, one- to six-cylinder like automobile, but with two-cycle engines common.

Marine engines—large, mostly Diesel, two- and four-cycle, single- and double-acting. Producer-gas engines have been tried on ships.

Aeronautic engines—similar to automobile engines, but wonderfully lightened; also multi-cylinder, V-shaped engines and revolving-cylinder engines. Two- and four-cycle.

The great advantages of gas engines over steam are the absence of boilers, coal and ashes, and the higher efficiencies obtainable. Small engines using city gas are more economical than similar-sized steam plants. Large steam plants produce power for lower cost than city gas, but can be equalled or bettered by producer gas and by some types of oil engines. Modern producer-gas units consume less than 1¼ lbs. of coal per horsepower hour. A Diesel engine will develop a horse-power hour on ½ lb. of Texas petroleum. A consumption of 1 pint of gasoline per horse-power hour is good practice for well-designed automobile engines. With other forms of fuel the efficiency varies with the type of engine and grade of fuel, but the total efficiency of well-designed gas engines ranges from 10% to 35% of the energy available in the fuel, as against 1% to 20% for steam practice.

Gaskill (gas'kil), ELIZABETH CLEGHORN, an English novelist born at Chelsea, England in 1810; died in 1865. In 1832 she married William Gaskill, a Unitarian minister. *Mary Barton* (1848), a novel of factory life brought her fame. This was followed by many others, including the well-known *Cranford*.

Gas Mantles, known commonly as Welsbach mantles, used with a Welsbach burner, are manufactured as follows: A textile form is knitted of cotton, ramie or silk, and this form is then saturated in a bath containing 98 per cent. thorium nitrate and 2 per cent. cerium nitrate. The textile form is then subjected to a hot flame which burns away the textile fabric and converts the partially fused earths into oxides. In this condition the mantles are exceedingly fragile. To impart to them the necessary body to permit of handling and transportation they are dipped in collodion. This collodion is what burns away when the mantle is first lighted after being put in place on the burner.

Gasoline (gas'o-lēn), a highly volatile, inflammable compound of fluid hydrocarbons, resulting from the distillation of crude petroleum or coal. It is used in carbonizing water gas and as fuel in vapor stoves, lamps and in gas engines for automobiles and other purposes.

Gasoline-Electric. A gasoline-electric road train was introduced in Germany in 1913. It comprises a power car and ten trailers each of 5 tons capacity. The power car carries the generator set, viz., two Daimler motors of 125 horsepower each, driving a dynamo installed in the center. The current is transmitted to the electric motors, actuating each of the wheels of the power car and trailers.

Gasoline Engine or GASOLINE MOTOR. See *Gas Engine*.

Gaspé (găs-pā), a district of Canada, prov. Quebec, on the south of the St. Lawrence estuary, washed by the Gulf of St. Lawrence, of which Gaspé Bay is an inlet. The fisheries are valuable. Gaspé Basin is a port on Gaspé Bay.

Gassendi (gas-sen'dē; properly GASSEND), PIERRE, a French philosopher and mathematician, born in 1592; died in 1655. His *Exercitationes Paradoxicæ adversus Aristotelem* (1624), while they gave great offense to the

Aristotelians, obtained him a canonry in the cathedral of Digne; but a second book of *Exercitationes* excited so much enmity that he ceased all direct attacks on Aristotle. He strenuously maintained the atomic theory, in opposition to the views of the Cartesians. His later works are *De Vita, Moribus et Doctrina Epicuri* (1647), *Syntagma Philosophiæ Epicuri* (1649), and lives of Tycho Brahe, Copernicus, Peurbach, and Regiomontanus (John Müller).

Gas-Stove, a stove which uses inflammable gas as a means of heating and cooking. Sheet-iron stoves of various patterns are used for this purpose, others take the form of logs of terra-cotta, pierced with holes for the outflow of the gas.

Gastein (gäs'tīn), or WILDBAD GASTEIN, a watering-place in Austria, 3000 feet above the sea, 48 miles south of Salzburg, with thermal springs (64° to 100°) containing salt and carbonates of magnesia and lime. It gives the name to a treaty signed here in 1865 by the Emperor of Austria and the King of Prussia, the non-observance of which led to the German war of 1866.

Gasteromycetes (g a s-t ē r-ō-mi-sē'-tes). See *Fungi.*

Gaston de Foix (gàs-ton de fwà), Duke of Nemours, a French soldier, born in 1489, son of John de Foix, Count d'Estampes, and Mary of Orleans, sister of Louis XII. whose favorite he became. At the age of twenty-three he routed a Swiss army, rapidly crossed four rivers, drove the pope from Bologna, and won the celebrated battle of Ravenna (1512), but was killed while attempting to cut off a body of retreating Spaniards.

Gastonia (gas-tō'ni-a), a town in Gaston Co., North Carolina, 22 miles w. of Charlotte. It has cotton mills, shirt factory, tannery, etc., and a large shipping business in cotton yarns and cloth. Pop. 5759.

Gastornis (gas-tōr'nis), a large fossil bird of more than one species, remains of which have been discovered in the lower Eocene deposits of Meudon, near Paris, and elsewhere. The bones indicate a bird as tall as the ostrich, and its structural peculiarities point to affinities with the Grallatores or wading-birds.

Gastralgia (gas-tral-gi-a), a severe pain in the stomach, generally arising from indigestion.

Gastræa See *Gastrula.*

Gastric Juice (gas'-trik jūs), a clear colorless fluid with an acid taste and sour odor secreted by the mucous membrane of the stomach, and chief agent in the process of digestion. It is acid, and contains pepsin, its essential nitrogenous principle. The activity of the fluid has been ascribed to various acids present, lactic, acetic, and butyric, but it appears that free hydrochloric acid is that which is secreted by the stomach, the others being the products of change of food undergoing digestion. The acid is necessary for the pepsin to exercise its properties, which are limited to the conversion of nitrogenous substances into *peptones,* fatty matters not being affected by it. (See *Pepsin.*) Gastric juice also holds in solution various inorganic salts, chiefly chlorides and phosphates, occasionally also abnormal substances such as urea, ammonia, salts, and biliary acids. It is not possessed of any marked reactions with ordinary chemical reagents, does not become turbid by boiling, and gives no striking precipitates with acids, alkalies, or mineral salts. The amount secreted daily in the human adult is estimated to be about 14 pounds, but as it is continually reabsorbed, there is no great quantity present at any one time.

Gastric System, all the parts of the body which contribute to digestion.

Gastritis (gas-trī'tis), or GASTROENTERITIS. See *Enteritis.*

Gastrochaena (g a s-t r ō-kēn'a), a genus of boring bivalves (*Gastrochænidæ*), which also includes the remarkable Aspergillum and Clavagella. The original shell has the two valves typical of Lamellibranchs; but these are delicate, and become surrounded by a secondary tubular shell lining the cavity which the mollusc bores into limestone, coral, and other shells.

Gastrocnemius (gas-trok-ne'mi-us), the most external of three superficial muscles forming the calf of the leg and terminating above the heel in the *tendo Achillis.*

Gastrolobium (gas-tro-lō'bi-um), a large genus of leguminous plants occurring in Southwestern Australia. Several of the species often prove fatal to cattle, and they are hence known as poison-plants.

Gastromalacia (gas'tru-ma-lā'si-a), softening of the stomach, a disease occurring in infants.

Gastropods (gas-trō'pods), or GASTEROPODS, a class of molluscs, consisting of animals usually inhabiting a univalve shell. The distinguishing characteristic is the foot, which is broad, muscular and disc-like, attached

to the ventral surface. The class is divided into two sub-classes the Branchiata or Branchiogastropoda, breathing water by gills, and the Pulmonata or Pulmogastropoda, breathing air by a sort of lung apparatus. The former include whelks and periwinkles, etc.; the latter include land-snails, slugs, pond-snails, etc.

Gastrostomy (gas-tros'to-mi), the operation of forming an artificial opening into the stomach with the view of introducing food when it cannot be received naturally on account of obstruction or stricture of the gullet.

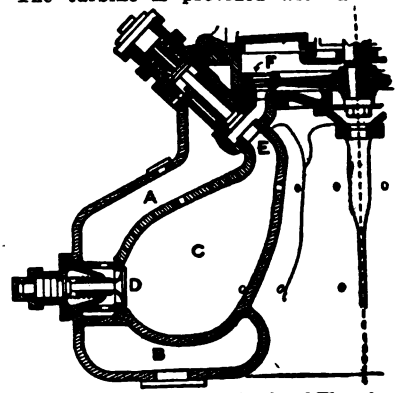
Gastrotomy (gas-trot'o-mi), in surgery, the operation of making an incision in the stomach to remove a diseased part of foreign body.

Gastrula (gas'troo-la) or GASTRAEA the name applied by Haeckel to a thimble-shaped larva which appears in the life history of many different kinds of organisms. Such a larva, as it occurs in an annelid, or in the simple vertebrate amphioxus, consists of an outer layer of cells, or ectoderm, and an inner or endoderm. The inner layer lines the gastral cavity, which communicates with the interior by an opening called the blastopore. The gastrula itself arises from a blastosphere, or hollow ball of cells, by the folding in of the cells at one point, as a thimble might be made by pushing in one side of a hollow ball. The outer and the inner layer of cells of the gastrula always give rise to definite organs of the future animal.

Gas Turbine, a turbine engine operating by the energy of exploded gases, first invented by Réné Armengaud in France, in 1906. Gas turbines are now of two types, the constant pressure and the explosion. The Armengaud engine is of the former type. The gas and air are compressed separately and the mixture admitted in a constant stream into a combustion chamber, where it is ignited by an incandescent platinum wire. The largest engine of this type ever produced was only 300 horsepower, and the death of the inventor left it unperfected.

Of the explosion type the Holzwarth turbine is the most efficient. In this the combustion chamber is intermittently filled with a mixture of gas and air admitted at the base of the machine. Ignition, explosion and increase in pressure of the burnt gases and their expansion through a nozzle result, after which the gases act on a horizontal turbine wheel. There are five or ten similar explosion chambers arranged in a circle at the base of the turbine, and these act one after the other or in series. When the combustion chamber has been filled with compressed air, compressed gas is driven in, while the nozzle valve remains closed. When the gas is ignited the valve is forced open and the pressure of the gases is transformed into kinetic energy. After each explosion the chamber is cleared and cooled by fresh air.

The turbine is provided with a horizontal governor shaft driven by a screw gearing. To this shaft are keyed the main governor, the emergency governor for preventing ignition, a tachometer, the ignition mechanism and the gear for operating a vertical oil distributor.



Holzwarth Gas Turbine.—Sectional Elevation.

A, compressed air chamber. B, compressed gas chamber. C, combustion chamber. D, valve admitting compressed air to combustion chamber. E, nozzle valve admitting exploding gas to rim of motor F.

Gates (gāts), HORATIO, an American soldier, born in England in 1728. At the capture of Martinique he was aide-de-camp to General Monkton, and he was with Braddock when the latter was defeated in 1755. On the conclusion of peace he purchased an estate in Virginia, on which he resided until the Revolutionary war in 1775. He was at the head of the American army of the north when the British general Burgoyne was forced to surrender his whole army at Saratoga (1777), though most of the credit for this victory belonged to the preceding commander, General Schuyler. In 1780, after the capture of General Lincoln by Clinton, at Charleston, Gates received the chief command of the southern districts, but was badly defeated two months later by Cornwallis at Camden. He was then superseded by General Greene and brought to court-

martial, but was finally acquitted, and reinstated in his command in 1782 after the capture of Cornwallis. He then retired to Virginia, and in 1790, having emancipated all his slaves, he removed to New York, where he died in 1806.

Gates, MERRILL EDWARDS, educator, born at Warsaw, New York, in 1848. He was principal of the Albany Academy, 1870-82, president of Rutgers College, 1882-90, and of Amherst College, 1890-99, and a Congregational minister after 1899. He wrote *International Arbitration, Highest Use of Wealth; Sidney Lanier, Poet and Artist*, etc.

Gateshead, a parliamentary and municipal borough of England, County Durham, on the right bank of the Tyne, opposite Newcastle, of which it is practically part, being connected with it by three bridges. The industrial establishments include works where heavy articles in iron, such as girders, anchors, and chain cables, as well as engines, etc., are made: shipbuilding yards, roperies, brass, copper, and iron foundries, paper, glue, vinegar, glass, artificial manure, and large chemical works. In the vicinity are quarries from which the celebrated 'Newcastle grindstones' are obtained, and numerous collieries. Pop. (1911) 116,928.

Gath (Hebrew, 'wine-press'), one of the five royal cities of the Philistines, which, from its situation on the borders of Judah, was of much importance in the wars of the Jews and Philistines. It was the native town of Goliath, and was successively captured by David, Hazael, and Uzziah, who dismantled it. The site cannot be determined with certainty, but it is sometimes identified with Tell-es-Safieh, between Ekron and Ashdod.

Gatineau (gat-i-nō'), a river of Canada, Quebec province, the largest affluent of the Ottawa, rising in some lakes, and flowing almost due south to enter the Ottawa nearly opposite Ottawa city. It is not navigable more than five miles above the Ottawa except by canoes, but its rapid waters are well stocked with fish, and available as waterpower. The country through which it flows is, however, only partially settled.

Gatling (gat'ling), RICHARD JORDAN, inventor, born in Hertford County, North Carolina, in 1818; died in 1903. He studied medicine, but never practiced, removing eventually to Hartford, Connecticut, where he invented several ingenious machines, the most important being the machine gun which bears his name.

Gatling-gun. See *Machine-gun.*

Gatshina, GATCHINA (gat-chi'na), a town of Russia, government of, and 35 miles S. S. W. of St. Petersburg, on a small lake. It is regularly built, and contains one of the finest of the imperial palaces of Russia. Pop. 14,735.

Gau (gou), a German word of doubtful origin, meaning in general district, but in a special sense a district as a political unit, and its inhabitants as a political association. It formed a sort of middle division between the highest unit, the state, and the lowest, the village, corresponding in some respects to the 'hundred.' The freemen of the Gau met at certain periods, under an elected head, to settle matters relating to the public weal; and in the same way the head men of the Gauen met to settle matters relating to the state at large. In the Frankish Empire the character of the Gau was altered, each Gau now having as its head one or more royal officers called grafs or counts. These countships became hereditary, and about the twelfth century the Gau ceased to exist as a political division, though the name has survived in Aargau, Thurgau, etc.

Gauchos (gä-ō'chōs), natives of the pampas of the La Plata countries in South America, of Spanish descent. The race is noted for their spirit of wild independence, for horsemanship, and the use of the lasso. Their mode of life is rude and uncivilized, and they depend for subsistence chiefly on cattle-rearing.

Gauge, GAGE (gāj), STEAM AND WATER, the instruments fixed to engine boilers for registering the force of steam and the level of the water. The first often consists of a siphon tube, with equal legs, half-filled with mercury. One end is fastened into a pipe, which enters that part of the boiler which contains the steam; the other end is open to the atmosphere. The steam, acting on the mercury in one leg of the gauge, presses it down, and the mercury in the other leg rises, the difference between the two columns being the height of mercury which corresponds to the excess of the pressure of the steam in the boiler above the pressure of the atmosphere; or, in other words, to the effective pressure on the safety-valve. For high-pressure engines the steam-gauge usually consists of a spiral tube into which the steam is admitted, and which becomes less bent the greater the pressure. The water-gauge is a vertical glass tube, or flat

case, communicating above and below with the boiler. Gauge-cocks are sometimes put instead of or in addition to the tubes, for enabling the engineer to verify the level of the water.

Gauge, a standard of measurement. As applied to railways, gauge signifies the distance between the centers of each pair of rails, which in the ordinary gauge used in the United States is 4 feet 8½ inches. The broad gauge, as in the Great Western Railway of England, is 7 feet; the Irish, Indian, and Spanish gauge is 5 feet 6 inches. Special narrow gauges have recently been adopted for mountain and mineral lines, such as the 3 feet 6 inch gauge of the Norwegian lines. Gauge is also the name applied to various contrivances for measuring any special dimension, such as the wire gauge, an oblong plate of steel, with notches of different widths cut on the edge and numbered, the size of the wire being determined by trying it in the different notches until one is found which it exactly fits. The thickness of sheet-metal is tried by a similar gauge.

Gaul (gâl), GALLIA, in ancient geography, the country of the Gauls, the chief branch of the original stock of Celts. It extended at one time from the Pyrenees to the Rhine, and included also a part of Italy. Hence it was divided into Gaul on this side (the Roman side) of the Alps, or Gallia Cisalpina, and Gaul beyond the Alps, or Gallia Transalpina. Later the former was regarded quite as part of Italy, and the name Gallia was restricted to Transalpine Gaul, or the country nearly corresponding to modern France. Julius Cæsar, about the middle of the first century B.C., found Transalpine Gaul divided into three parts: 1. Aquitania, extending from the Pyrenees to the Garonne, chiefly occupied by Iberian tribes; 2. Gallia Celtica, Celtic Gaul, from the Garonne to the Seine and Marne; 3. Gallia Belgica, Belgic Gaul, in the north, extending to the Rhine.

Migrations among the Gauls about 397 B.C., and their passage of the Alps, first bring the Gallic nation into the region of history. Having crossed the Alps they fell upon the Etruscans, defeated the Romans at Allia (390 B.C.), and sacked and burned Rome, the capitol, however, being saved by Camillus. More than a century after the burning of Rome, the eastern Gauls, in 280-278 B.C., made three destructive irruptions into Macedonia and Greece. Several tribes pursued their course into Asia Minor, where, under the name of *Galatians*, they long retained their national peculiarities. After these migrations the Gauls along the banks of the Danube, and in the south of Germany disappeared. Tribes of German origin occupied the whole country as far as the Rhine, and even beyond that river. The Belgæ, who were partly German, occupied the northern part of Gaul, from the Seine and Marne to the British Channel and the Rhine, from whence colonists passed over into Britain, and settled on the coast districts. The Celts in Gaul had attained some degree of cultivation by intercourse with the Greeks and Carthaginians before they came in contact with the Romans. Those of Cisalpine Gaul continued formidable to Rome until after the First Punic war, when the nation was compelled, as the result of a war of six years, to submit to the Romans (220 B.C.). When Hannibal marched on Rome they attempted to shake off the yoke; but the Romans, victorious over the Carthaginians, reduced them again to submission. Thirty-one years later (189 B.C.) their kindred tribe in Asia, the Galatians, met with the same fate; they also were vanquished, and their princes (tetrarchs) became tributary. In the years 128-122 B.C. the Romans conquered the southern part of Gaul along the sea from the Alps to the Pyrenees, and here established their dominion in what was called the Province (Provincia), a name that still exists as Provence. Not long after Gaulish tribes shared in the destructive incursions of the Cimbri and Teutones on the Roman territory, which were ended by Marius in the battles of Aquæ Sextiæ (Aix) in 102, and Vercelli in 101 B.C. On the appointment of Julius Cæsar to the proconsulship over the countries bordering on Gaul, he resolved to subject all Gaul, and executed his purpose in less than nine years (58-50 B.C.), in eight bloody campaigns. The dominion of the Romans in Gaul was confined by colonies, and the liberal grant of the Roman citizenship to several Gallic tribes. The religion of the Druids, being suppressed in Gaul by Tiberius and Claudius, gradually retreated into Britain, soon also conquered by the Romans. After the extinction of the Cæsars, the Gauls once more attempted to recover their liberty by aid of the Germans, but after this last effort became entirely Romanized, even their ancient language, the Celtic, being supplanted by a corrupt Latin dialect. About the year 486 the Franks subdued the greater part of Gaul, and put a period to the dominion of the Romans in that country. See *France*.

Gault (gâlt), in geology, a series of stiff marls or calcareous clays,

varying in color from a light gray to a dark blue, occurring between the Upper and Lower Greensands of the Chalk formation of England. It is developed chiefly in the neighborhood of Folkestone (hence called *Folkestone marl*), and in Cambridgeshire.

Gaultheria (gâl-thē'ri-ă), a genus of American shrubs belonging to the order Ericaceæ. It is widely distributed in North America. *G. procumbens*, the well-known wintergreen plant, is a creeper bearing white flowers, and in the fall edible red berries.

Gauntlet, or GANTLET (gânt'let, gant'let), a glove made originally of chain-mail, later of plate and jointed at the fingers, used as part of the armor of a warrior in former times.

Gaur, or GOUR (gour), a ruined city in Hindustan, 60 miles north by west of Murshedabad. Once the capital of Bengal, extending about 7 miles along the old Ganges. Several villages now stand on the site of the city.

Gaur, GOUR, one of the largest of all the ox tribe (*Bos gaurus* or *Bibos gaurus*), inhabitating the mountain jungles of India, remarkable for the extraordinary elevation of its spinal ridge, the absence of a dewlap, and its white 'stockings,' which reach above the knee. It is so fierce when roused that neither tiger, rhinoceros, nor elephant dare attack it. The hide on the shoulders and hindquarters is sometimes nearly 2 inches in thickness even after being dried, and is therefore much valued for the purpose of being manufactured into shields. The animal is supposed to be incapable of domestication.

Gauss (gous), KARL FRIEDRICH, a German mathematician, born 1777. In 1801 he published his *Disquisitiones Arithmeticæ*, treating of indeterminate analysis or transcendental arithmetic, and containing, in addition to many new theorems, a demonstration of the theorem of Fermat concerning triangular numbers. He also calculated, by a new method, the orbit of the planets Ceres and Pallas. In 1807 he became professor of mathematics and director of the observatory at Göttingen, a position which he held till his death in 1855. He was pronounced by Laplace to be the greatest mathematician in Europe. His chief works were the *Theorio Motus Corporum Cœlestium* (1809), *Intensitas Vis Magneticæ Terrestris* (1833), *Dioptrische Untersuchungen* (1841), and *Untersuchungen über Gegenstände der höheren Geodesie* (1844).

Gaut. See *Ghâts.*

Gautama (gą'ta-ma), a name of Buddha, the founder of Buddhism. See *Buddha.*

Gautier (gō-ti-ā), THÉOPHILE, a French poet and critic, born in 1811 at Tarbes (Hautes-Pyrénées). He studied painting under Rioult for two years, but gave up the brush for the pen, threw himself vigorously into the Romanticist movement, published a volume of poems in 1830, and for several years worked at general literary criticism. In 1832 appeared his poem *Albertus;* but his first great success was the romance *Mademoiselle de Maupin*, which led to his engagement by Balzac as secretary. He was afterwards engaged as theatrical and art critic on the *Revue de Paris*, the *Artiste*, *the Moniteur*, and the *Journal Officiel*. Owing to his connection with the *Journal Officiel* his fortunes became linked in some measure with those of the Bonaparte family, and he was appointed librarian to the Princess Mathilde. In 1872 he was sent by the republican government on a literary mission to Italy, and died in the same year. Among the most interesting of his productions may be ranked his *Voyages en Espagne* (1843), his *Italia* (1852), *Caprices et Zigzags* (1845), and *Constantinople* (1854), narratives of his travels; his *Roman de la Momie* (1856), *Le Capitaine Fracasse* (1863), *Belle Jenny* (1865), *Spirite* (1866), novels, together with the brilliant short stories, *Fortunio*, *Une Nuit de Cléopâtre*, *Jean et Jeanette*, *Le Roi Candaule*, etc.; and his *Histoire de l'Art Dramatique en France depuis Vingt-cinq Ans* (1849), *Les Beaux Arts en Europe* (1852), etc.

Gauze (gąz), a thin transparent stuff of silk, linen, or cotton. It is either plain or figured, the latter being sometimes worked with flowers of silver or gold.

Gavarni (gâ-vâr'nē), the assumed name of SULPICE PAUL CHEVALIER, a French caricaturist, born at Paris in 1801. Originally a mechanical draughtsman, he began his artistic career in 1835 by designing costumes for theaters and journals of fashion. He then established *Les Gens du Monde;* but the journal was a failure, and the artist spent some time in the debtor's prison of Clichy. On his release he was employed upon the *Charivari*, the success of which was due in great part to his genius. His best known works are *Les Enfants Terribles*, *Les Rêves*, *Les Fourberies de Femmes*, and *Impressions de Ménages*. In 1847 he visited England, and the sketches which he sent from St.

Giles, London, to *L'Illustration* created an immense sensation. He afterwards illustrated Eugene Sue's *Wandering Jew*, Balzac's novels, and other works. He died in 1866.

Gavazzi (gä-vät'sē), ALESSANDRO, a popular Italian preacher and political agitator, born at Bologna 1809; died at Rome 1889. At the age of fifteen he became a monk of the Barnabite order, at twenty he was professor of rhetoric in the College of Naples, and soon after made his mark as a pulpit orator. In 1846 he was chaplain general of the Roman patriotic league. Subsequently he threw off his papal allegiance and joined the agitation which ended in the short-lived republic. The French occupation of Rome drove him into exile, when he traveled through Britain and America lecturing against the Church of Rome, his power as an orator evoking much enthusiasm. He was with Garibaldi in 1860, and made subsequent visits to Britain gathering funds for the Free Italian Church, in the interests of which he lectured, preached, and traveled on deputation work till a short time before his death.

Gavelkind (gā'vel-kīnd), an old English tenure, by which the land of the father was at his death equally divided among his sons, or in default of sons, among the daughters. The issue of a deceased son inherited the father's part. Collaterally, also, when one brother died without issue all the other brothers inherited from him. Gavelkind, before the Norman conquest, was the general custom of the realm; it was then superseded by the feudal law of primogeniture, and only retained in Wales and Kent. The custom continued in Wales till the time of Henry VIII; in Kent all land is still held in gavelkind unless specially disgaveled by act of Parliament.

Gavial (gā'vi-al; *Gavialis Gangeticus*), the Indian crocodile, characterized by the narrow, almost cylindrical jaws which form an exceedingly elongated muzzle. The teeth (about 120 in number) are of equal length, and the feet are completely webbed. The males can be distinguished from the females by the shape of the muzzle, which is much smaller at the extremity. The only extant species occurs in South and Eastern Asia, especially in the Ganges. It feeds on fishes and small prey.

Head of Gavial or Gangetic Crocodile (*Gavialis Gangeticus*).

Gavotte (ga-vot'), an air for a dance with two strains, each of four or eight bars, in $\frac{2}{4}$ or $\frac{4}{4}$ time, the starting notes occupying half a bar. Like the minuet, it has been introduced for free treatment into suites, sonatas, etc. The name is said to be derived from the Gavots, the inhabitants of the Gap, in France.

Gay (gā), JOHN, an English poet, born near Barnstaple in 1688, and apprenticed to a silk mercer in London. In 1711 he published his *Rural Sports*, which he dedicated to Pope, with whom he formed a close friendship. In 1712 he became secretary to Anne, Duchess of Monmouth, and his mock-heroic poem, *Trivia, or the Art of Walking the Streets of London*, appeared in the same year. In 1714 his caricature of Ambrose Philips' pastoral poetry was published, under the title of the *Shepherd's Week*, and dedicated to Lord Bolingbroke, by whose interest he was appointed secretary to the Earl of Clarendon, in his embassy to the court of Hanover. In 1715 appeared his burlesque drama of *What d'ye Call It?* but his next piece, the farce, *Three Hours After Marriage*, altogether failed. In 1720 he published his poems by subscription, in 1723 his tragedy, *The Captives*, and in 1726 his well-known *Fables*. His *Beggar's Opera*, the notion of which seems to have been afforded by Swift, was first acted in 1727, at Lincoln's Inn Fields, where it ran for sixty-three nights, but the lord chamberlain refused to license for performance a second part entitled *Polly*. The latter part of his life was spent in the house of the Duke of Queensberry, where he wrote his sonata *Acis and Galatea* and the opera *Achilles*. He died in 1732.

Gay, MARIE-FRANÇOISE-SOPHIE, a French authoress, born at Paris in 1776; maiden name, Nichault de Lavalette. She was first married to a financier, M. Liottier, from whom after six years she was divorced to marry M. Gay, a receiver general under the empire. Her salon was a famous resort for the men of letters and artists of the time. She died at Paris in 1852. Her chief works are *Laure d'Estell* (1802), *Anatole* (1815), *Le Moqueur Amoureuse* (1830), *Scènes de Jeunes Ages* (1833), *La*

Duchesse de Châteauroux (1834), *Les Salons Célèbres* (1837), and *Le Mari Confident* (1849). For her daughter, DELPHINE GAY, see *Girardin* (*Madame de*).

Gaya (gī'â), the chief town of a district of the same name in Bengal, on the right bank of the Phalgu, a tributary of the Ganges, 260 miles N. W. of Calcutta. It consists of an old and a new town. The former occupies a rocky height, is inhabited chiefly by Brahmans, and being regarded as a place of great sanctity, is annually visited by vast crowds of pilgrims. The latter, called Sahibganj, is the trading quarter, and the seat of administration where the European residents dwell. The place abounds with objects of Hindu worship, and almost every height in the vicinity is the subject of a legend. Pop. 71,288. The district has an area of 4712 square miles.

Gayal, GYAL (gī'al), a species of ox (*Bos frontālis*) found wild in the mountains of Northern Burmah and Assam, and long domesticated in these countries and in the eastern parts of Bengal. The head is very broad and flat in the upper part, and contracts suddenly towards the nose; the horns are short and slightly curved. The animal has no proper hump, but on the shoulders and forepart of the back there is a sharp ridge. The color is chiefly a dark brown. Its milk is exceedingly rich, though not abundant.

Gayarre (gī-â-râ'), CHARLES ARTHUR, historian, born in Louisiana in 1805; died in 1895. He was secretary of state of Louisiana 1846-53, and presiding judge of the city of New Orleans. He wrote *History of Louisiana* and *Louisiana: Its History as a French Colony.*

Gay-Lussac (gā-lûs-âk), LOUIS JOSEPH, a French chemist and physicist, born at St. Léonard (Haute-Vienne) in 1778; died at Paris in 1850. He was educated in the Ecole Polytechnique from 1797 to 1800, and afterwards in the Ecole des Ponts et Chaussées, but preferring chemistry, he entered Berthollet's Ecole Laboratory. In 1802 he returned to the Polytechnique as demonstrator of chemistry, and in 1804 performed his two balloon ascents for scientific purposes, the first with Biot, the second by himself, an account of which appeared in the *Journal de Physique.* In 1806 he was elected to the Academy of Sciences. In 1808 he was appointed professor of physics at the Sorbonne, a post he held for twenty-four years, in 1809 professor of chemistry in the Ecole Polytechnique, and then succeeded Fourcroy as professor of general chemistry in the Jardin des Plantes. In 1831 he entered the chamber of deputies, and in 1839 he was made a peer of France, but he never took an active part in politics. He was especially celebrated for his researches into the chemical and physical properties of gases and vapors. For many years he edited, in conjunction with Arago, the *Annales de Chimie et de Physique;* and many of his numerous memoirs were published in this or in the *Comptes Rendus.* He also published, along with Thénard, *Recherches Physico-chimiques,* in which some of their most important discoveries are described. Other works are his *Cours de Physique* and *Leçons de Chimie.*

Gaynor (gā'nor), WILLIAM J., jurist, born at Whitestown, New York, in 1851. He went to Brooklyn in 1873 and worked on Brooklyn and New York newspapers while studying law. Was admitted to the bar in 1875, and took part in many important cases, becoming known nationally for his work in breaking up rings in the Democratic party and in securing the conviction of John Y. Kane for election frauds. He was elected judge of the Supreme Court of New York in 1893 and again in 1907, for twelve years, declined a nomination for mayor of Brooklyn in 1897, also for governor of New York and for judge of the Court of Appeals, and in 1909 was elected Democratic mayor of New York. As such he gave eminent satisfaction by his earnest efforts to improve conditions in that city. In the nominating convention for governor in 1910 he declined to let his name be used. He was shot by a disappointed office-seeker in the summer of 1910, receiving a serious but not a fatal wound. He died September 11, 1913.

Gaza (gā'za), an ancient town of Syria, originally a city of the Philistines, near the Mediterranean, 50 miles S. S. W. of Jerusalem. The modern town, Ghuzzeh, is a principal entrepôt for the caravans passing between Egypt and Syria. The population has increased rapidly of recent years and is now estimated at 16,000.

Gaza (gâ'zâ), THEODORE, a Renaissance scholar, born at Thessalonica about 1405; died in Calabria in 1478. He came to Italy about 1430; became teacher of Greek at Ferrara; was patronized by Pope Nicholas V, Cardinal Bessarion, and King Alfonso of Naples. Gaza labored for the diffusion of Greek literature, not only by teaching, but also by his writings, and especially by Latin translations of the Greek clas-

sics. His chief work is a translation of the writings of Aristotle on natural history.

Gazelle (ga-zel'; *Gazella dorcas*), the type of a sub-family of antelopes (Gazelinæ), which includes some 23 species of small, mostly desert-loving forms. Its color is a light fawn upon the back, deepening into dark-brown in a wide band which edges the flanks and forms a line of demarcation between the color of the upper portions of the body and the pure white of the abdomen. The eye of the gazelle is large, soft, and lustrous. Both sexes are provided with horns, round, black, and lyrated, about 13 inches long. It seems to be confined to the north side of the Atlas Mountains, Egypt, Abyssinia, Syria, Arabia, and South Persia.

Gazelles (*Gazella dorcas*)

Gazette (ga-zet'; from *gazzetta*, a small Venetian coin, which was the price of the first newspaper), a newspaper, especially an official newspaper. The first gazette in England was published at Oxford in 1655. On the removal of the court to London the title of *London Gazette* was adopted. It is now the official newspaper, and published on Tuesdays and Fridays. It is the organ by means of which all state intelligence, proclamations, appointments, etc., are promulgated, and in which declarations of insolvency are published. A similar official newspaper is published also in Edinburgh and Dublin.

Gazetteer (gaz-e-tēr'), a geographical dictionary; a book containing descriptions of natural and political divisions, countries, cities, towns, rivers, mountains, etc., alphabetically arranged. Among the more important general works of this kind are McCulloch's *Geographical Dictionary*, Johnstone's *Dictionary of Geography*, Blackie's *Imperial Gazetteer*, Lippincott's *Pronouncing Gazetteer* (based upon Blackie's), Saint Martin's *Nouveau Dictionnaire de Géographie Universelle*, and Ritter's *Geographisch-Statistisches Lexikon*. There are also various gazetteers confined to particular countries.

Gazogene (gaz'u-jēn), an apparatus used for manufacturing aerated water on a small scale for domestic use, by the combination of an alkali and an acid, as carbonate of soda and tartaric acid, which yield carbonic acid when mixed with water. It generally consists of two globes, one above the other, connected by a tube, the lower for containing water, and the upper the ingredients for producing the gas. The vessel is made air-tight by means of a screw-top, and when water is gently introduced into the upper globe from the lower, by inclining the vessel so as to fill about a half of the former, chemical action takes place, and the carbonic acid evolved gradually saturates the water in the lower globe. When this has taken place, the aerated water can be drawn off by opening a stopcock at the top attached to a second tube which reaches almost to the bottom of the lower globe.

Gean (gēn), a kind of wild cherry-tree (*Prunus Avium*), common in Britain. The fruit is smaller than that of the common cherry, of a red color when unripe, and a deep purple or black when it arrives at maturity. The flavor is superior to that of most cherries. The wood is used for furniture and other purposes.

Gearing (gēr'ing), in machinery, the parts collectively by which motion communicated to one portion of a machine is transmitted to another, generally a train of toothed wheels. There are two chief sorts of wheel gearing, viz. *spur-gearing* and *beveled gearing*. In the former the teeth are arranged round either the concave or convex surface of a cylindrical wheel in the direction of radii from the center of the wheel, and are of equal depth throughout. In *beveled gearing* the teeth are placed upon a beveled surface round a wheel which if the slope of the bevel were continued would form a cone.

Geary (gē're), JOHN WHITE, born in Westmoreland County, Pennsylvania, in 1819; died in 1873. He became an engineer officer in the Mexican war, and then the first United States postmaster of San Francisco. Returning to the East in 1856, he became governor of Kansas Territory and restored order there, but resigned in 1857. During the Civil war he served with distinction and became a brigadier general, and at the close major general. In 1866 he was elected governor of Pennsylvania and re-elected in 1869.

Gebang Palm (gē-bang'), the *Corypha gebanga*, a fan-leaved palm of S. E. Asia.

Geber (gē'bėr), an Arabian chemist or alchemist, often designated the father of chemistry, who flourished during the eighth century. He was

acquainted with nearly all the chemical processes in use down to the eighteenth century. His writings describe various kinds of furnaces and other apparatus, and cupellation, distillation, and other chemical processes; the purification, composition, and properties of the metals then known—gold, silver, copper, lead, tin, and iron, and the functions of mercury, sulphur, and arsenic. He is the reputed author of an immense number of works, as well on metaphysics, language, astronomy, etc., as on chemistry.

Gecko (gek'ō), a name common to the members of a family of nocturnal lizards (*Geckotidæ*), characterized by the general flatness of their form, especially of the head, which is somewhat of a triangular shape; the body is covered on the upper part with numerous round prominences or warts; the feet are rather short, and the toes of nearly equal length and furnished with flattened sucking pads by means of which the animals can run up a perpendicular wall, or even across a ceiling. The greatest number feed on insects and their larvæ and pupæ. Several of the species infest houses, where, although they are perfectly innocuous, their appearance makes them unwelcome tenants. One species is common in N. Africa and S. Europe.

Ged (ged), WILLIAM, the inventor of stereotyping, born in Edinburgh about the beginning of the eighteenth century; died in poor circumstances in 1749. He first practiced his great improvement in the art of printing in 1725; and some years later he entered into a partnership in London, the result of which was the production of two prayer-books only. He returned to Scotland in 1733, and published a stereotype edition of Sallust.

Geddes (ged'es), ALEXANDER, a Roman Catholic divine, poet, and miscellaneous writer, was born in Banff, Scotland, in 1737; died in London 1802. His works include a translation of the Bible, pamphlets, and poems.

Geddes, SIR ERIC CAMPBELL, British railroad expert and First Lord of the Admiralty, was born in 1875 in India of Scotch parents. When he was seventeen he came to America. In Alabama he worked as a lumberjack and sailed for Australia when he was twenty-one. He spent a year sheep herding and went to India, where, within five years, he became traffic manager of a railroad. From there he was promoted to the management of the North Eastern Railway of England. In May, 1915, he was made Deputy Director General of Munitions, and Premier Lloyd George appointed him Director of Military Railways and Director-General of Transportation in France. On the retirement of Sir Edward Carson he became First Lord of the Admiralty.

Geddes, JENNY, the name tradition gives to a street fruit-seller who, during the tumult in St. Giles' Church, Edinburgh, in July, 1637, when the dean attempted to introduce the Episcopalian service-book, threw her stool at his head exclaiming, 'Villain! dost thou say mass at my lug?' This tumult led to events which annulled Episcopacy and restored Presbyterianism. The honor of the exploit has been claimed for a Barbara Hamilton, wife of John Mein, merchant in Edinburgh, but Jenny Geddes, the street fruit-seller's claim, has always been the popular one, and recently a memorial brass was placed in St. Giles to her memory.

Geefs (gāfs), GUILLAUME, a Belgian sculptor, born at Antwerp 1806, died 1883. Among his most important works are the monument to the Victims of the Revolution of 1830 at Brussels; a statue of Rubens in front of Antwerp Cathedral; statues of King Leopold, etc. His brothers JOSEPH (died 1860) and ALOYS (died 1841) were also sculptors of reputation.

Geel (gāl). See *Gheel.*

Geelong (gē-long'), an Australian seaport town, colony of Victoria, near the head of the west arm of Port Philip Bay, 45 miles southwest of Melbourne. The town is well laid out, and there is an extensive botanical garden and several public parks. There are three jetties in the bay, alongside of which ships of the largest tonnage can load and discharge. There are wool mills, tanneries, ropeworks, etc., and a considerable trade is done in wool. Pop., inclusive of suburbs, 23,311.

Geestemünde (gā's'tē-mün-dē), a seaport town of North Prussia, in Hanover, at the mouth of the Weser, separated from Bremerhaven by the Geeste. Extensive docks were constructed here in 1857-63. The port is strongy fortified, and the trade is increasing rapidly. The industries include shipbuilding, iron-founding, engineering, etc. Pop. 23,625. Geestendorf, formerly a separate town, has been united with it since 1889.

Geez (gēz), the name of an Ethiopian language. See *Ethiopia.*

Gefle (yef'le), a seaport of Sweden, near the mouth of a river of same name in the Gulf of Bothnia, 50 miles N. of Upsala. It stands on both

sides of the river and two islands formed by it, and has an excellent harbor. It has manufactures of linen, leather, tobacco, sail-cloth, etc.; shipbuilding yards; and an extensive trade in deals, tar, pitch, iron, etc. Pop. 29,522.

Gegenbaur (gā'gen-bour), anatomist, born at Würzburg, Germany, in 1826. He studied biology, became professor of anatomy at Jena in 1858 and at Heidelberg in 1873. He wrote several able works, chief among which is his *Outline of Comparative Anatomy.*

Gehenna (gē-hen'a), a term used in the New Testament as equivalent to a place of fire or torment, and rendered in the authorized (and the revised) version by *hell* and *hell-fire.* It is a form of the Hebrew *Ge-hinnom,* the valley of Hinnom, in which was Tophet, where the Israelites sometimes sacrificed their children to Moloch (II Kings, xxiii, 10). On this account the place was afterwards regarded as a place of abomination, and became the receptacle for the refuse of the city, perpetual fires being kept up in order to prevent pestilential effluvia.

Geibel (gī'bl), EMANUEL, a German poet, born at Lübeck in 1815; died 1884. He studied at the universities of Bonn and Berlin, and resided a year or two in Greece. He published in 1840 his first collection of poems, which reached its hundredth edition in 1884. In 1843 he published a tragedy, *King Roderick;* in 1846 the epic *König Sigurd's Brautfahrt.* A second collection of his poems appeared in 1848—*Juniuslieder* ('June Songs'). Other collections were issued later. He was honorary professor of æsthetics and poetry in the University of Munich 1851-69, but spent his later days in his native town. He wrote also *Brunhild,* a tragedy; *The Loreley,* an opera in rhyme; and several other plays, but his fame rests on his lyrics, which are immensely popular.

Geikie (gē'ki), SIR ARCHIBALD, geologist, born at Edinburgh in 1835. He was appointed to the geological survey in 1855; became director of the Scottish survey in 1867; was professor of geology and mineralogy in Edinburgh University 1870-81, and in 1881 became director general to the United Kingdom survey, and head of the Museum of Practical Geology, London. He is the author of numerous manuals, etc., on geology.

Geikie, JAMES, geologist, brother of Archibald Geikie, was born at Edinburgh in 1839. He was engaged on the Scottish survey from 1861 until he succeeded his brother in the geological professorship at Edinburgh in 1882. He is the author of *The Great Ice Age, Prehistoric Europe, Outlines of Geology,* etc. He died March 2, 1915.

Geissler's Tubes (gīs'lĕr), from the name of Heinrich Geissler, a philosophical instrument-maker of Bonn, who produced tubes made of very hard glass, and containing highly rarefied gases. Each end of the tube has a platinum wire sealed into it to serve as an electrode. When a discharge of electricity from an induction coil is caused to take place in these tubes, very brilliant effects may be produced.

Gela (jē'la), one of the most important ancient Greek cities of Sicily, situated on the south coast of the island between Agrigentum and Camarina; founded in 690 B.C. by a colony of Cretans and Rhodians. The colony was remarkably prosperous, and in 582 B.C. sent out a portion of its inhabitants, who founded Agrigentum. In 280 Phintias, the tyrant of Agrigentum, utterly destroyed Gela. Its site has been the subject of much controversy.

Gelada (gel'a-da), a singular Abyssinian baboon, remarkable for the heavy mane which hangs over the shoulders, and which only grows when the animal is adult. It is called *Gelada Ruppellii,* in honor of Dr. Ruppell, its discoverer.

Gelasius (je-la'si-us), the name of two popes—GELASIUS I and II. The former, who held the see from 492-496, founding on the alleged primacy of Peter, was one of the first who openly maintained that the Roman bishop alone was entitled to regulate matters of faith and discipline, though in practice he had not then attained any such superiority. GELASIUS II, pope for only one year (1118-19), and originally called John of Gaeta, was elected by the party hostile to Henry V, but was obliged to give way to Gregory VIII, supported by the emperor, and shortly after died in the monastery of Clugny.

Gelatine (jel'a-tin), a concrete animal substance, transparent, and soluble slowly in cold water, but rapidly in warm water. It is confined to the solid parts of the body, such as tendons, ligaments, cartilages, and bones, and exists nearly pure in the skin, but it is not contained in any healthy animal fluid. Its leading character is the formation of a tremulous jelly when its solution in boiling water cools. Gelatine does not exist as such in the animal tis-

sues, but is formed by the action of boiling water. The coarser forms of gelatine from hoofs, hides, etc., are called *glue;* that from skin and finer membranes is called *size;* and the purest gelatine, from the air-bladders and other membranes of fish, is called *isinglass.* With tannin a yellowish white precipitate is thrown down from a solution of gelatine, which forms an elastic adhesive mass, not unlike vegetable gluten, and is a compound of tannin and gelatine. It is this action of tannin on gelatine that is the foundation of the art of tanning leather. In relation to the arts the uses of gelatin have been greatly extended. It is the foundation of the dry-plate system of photography; it is used in the printing process employed by Goupil of Paris and others for making highly artistic copies of pictures; and it is extensively utilized by druggists for coating pills and nauseous drugs. In the form of isinglass it is employed by brewers for clarifying beer, and also for wine, by reason of its forming a coagulum when acted upon by the chemicals of those liquids and precipitating the extraneous matter held in solution.

Gelderland, GUELDERLAND (gel'derland), a province of the Netherlands; area, 1963 English sq. miles. It is generally flat, and has much alluvial soil, well fitted both for arable and grass husbandry. The manufactures, principally woolen, cotton, and linen goods, soap, salt, and glass, are carried on extensively in various quarters. The principal towns are Arnheim, Nijmegen, Thiel, and Zutphen. Pop. 566,549.

Geldern (gel'dĕrn), a town of Rhenish Prussia, 27 miles northwest of Düsseldorf. Pop. 6551.

Gelder-rose. See *Guelder-rose.*

Gelee (zhē-lā'), CLAUDE. See *Claude Lorraine.*

Gell (jel), SIR WILLIAM, an English antiquarian and classical scholar, born in 1777; died at Naples in 1836. He was educated at Cambridge, and was for some time a fellow of Emanuel College in that university. In 1814 the Princess of Wales (afterwards Queen Caroline) appointed him one of her chamberlains, and he accompanied her on her travels for several years. His principal works are: *The Topography of Troy, The Geography and Antiquities of Ithaca, The Itinerary of Greece, The Itinerary of the Morea, The Topography of Rome,* and the interesting and beautiful work, *Pompeiana, or Observations Upon the Topography, Edifices, and Ornaments of Pompeii.*

Gellert (gel'ĕrt), CHRISTIAN FÜRCHTEGOTT, a German poet, born in 1715; died in 1769. He was appointed extraordinary professor of philosophy at Leipzig in 1751, where his lectures were received with great applause. His hymns, tales, fables, and essays enjoyed much popularity in their day.

Gellius (jel'lius), AULUS, a Roman author of the second century. His *Noctes Atticæ,* a book of selected passages from many ancient authors, is now of great value, as the authors from which he drew his materials are in a great measure lost.

Gelnhausen (geln'hou-zn), an old walled town of Prussia, province Hesse-Nassau, 16 miles E. N. E. of Hanau, on the Kinzig. Its principal buildings are a large Gothic church of the thirteenth century, and, on an island in the Kinzig, a recently-restored palace in which Frederick Barbarossa and several of his successors used to reside. Pop. 4500.

Gelon (jē'lon), an ancient Greek ruler, tyrant of Gela, and afterwards of Syracuse. After the death of Hippocrates, tyrant of Gela, he seized the sovereign power (B.C. 491), and about 485 B.C. gained possession of Syracuse. From this time he bent all his energies to the aggrandizement of his new capital, the power and importance of which he greatly increased by his conquests and good government. His aid was sought by the Greeks against Xerxes, but a formidable invasion of Carthaginians under Hamilcar engaged him in Sicily. The result was the total defeat of the Carthaginians in the great battle of Himera (B.C. 480). It is celebrated in an ode by Pindar. Gelon died in 478 B.C., and was succeeded by his brother Hieron.

Gelsemium (jel-se'mi-um), a genus of plants belonging to the nat. order Loganiaceæ, the best-known, *G. nitidum* or Carolina jasmine, being an evergreen climbing shrub of the Southern States, with twigs producing a milky juice, opposite lance-shaped shining leaves, and sweet-scented yellow flowers. The root has valuable medicinal properties, being used for controlling certain forms of nervous irritability.

Gemara (ge-mä'ra), in Jewish literature, the second part of the Talmud or commentary on the Mishna. See *Talmud.*

Gembloux (zhăn-blö), an old Belgian town, province of Namur, 24 miles S. E. of Brussels. It has a Benedictine abbey of the ninth cen-

tury, now used as a royal agricultural institution. Pop. 4643.

Gemini (jem'i-nī, the Twins (II), the third sign of the zodiac, so named from its two brightest stars, Castor, of the first magnitude, farthest to the west, and Pollux, of the second, farthest to the east. Its constituent stars form a binary system revolving in about 250 years. The sun is in Gemini from about May 21st till June 21st, or the longest day.

Gemmation (jem-mā'shun), in zoology, a mode of reproduction among certain animals of low type, which consists in the production of a bud or buds, generally from the exterior, but sometimes from the interior, of the body of the animal, which buds are developed into independent beings that may or may not remain attached to the parent organism. The fresh beings thus produced are known as zooids. Gemmation is also observed in plants of simple organization such as the yeast.

Gems (jems), or precious stones, are sometimes found crystallized in regular shapes and with a natural polish, more commonly of irregular shapes and with a rough coat. The term gem often denotes more particularly a stone that is cut, polished, or engraved, and it also includes pearls and various artificial productions. Precious stones in their natural state are usually encrusted with various deposits; and it is to remove this crust and to bring out the real beauty of the gem that the work of cutting and polishing is performed. The stones that are thus treated include the ruby, diamond, emerald, sapphire, garnet, topaz and amethyst. These are classed as transparent stones. The opal is semi-transparent. Among the more or less opaque stones are the turquoise, lapis lazuli, agate, onyx, cat's-eye, moonstone, bloodstone, jade and carnelian. Imitation gems are extensively manufactured. The base of one class of imitations is a peculiar kind of glass of considerable hardness, brilliancy and refractive power called *paste* or *strass*. When the strass is obtained very pure it is melted and mixed with substances having a metallic base, generally oxides, which communicate to the mass the most varied colors. Another class often fraudulently offered for sale as genuine stones are made by cementing thin plates of precious materials over and sometimes under a body of worthless glass. This veneered stone successfully undergoes the surface test, and by the uninitiated is often accepted as a valuable gem.

The art of manufacturing gems synthetically, that is, by the combination of chemical elements present in the real stone, has reached a high degree of success. The diamond, which is an allotropic form of carbon, has hitherto resisted attempts to reproduce it of sufficient size to have a commercial value. By dissolving carbon in molten iron and suddenly cooling the molten mass by a stream of water, whereupon the outer part contracts with great force and compresses the interior so that the carbon separates out, Moissan, the French chemist, succeeded in isolating small crystals, none, however, as large as 1/25 inch in diameter.

Experiments in the manufacture of the ruby have met with such success that the synthetic ruby is produced of a size and of a perfection that would place a prohibitive value on the natural stone. The ruby, chemically considered, is crystallized alumina, or oxide of aluminum, with a small percentage of oxide of chromium. Sapphire is of the same material, differing from the ruby only in color. The ruby owes its fine red color to the presence of oxide of chromium; the sapphire its deep blue to either a lower oxide of chromium or to an oxide of titanium. Crystallized alumina in the different colors receives different trade names, as Oriental emerald for the green; Oriental topaz for the yellow; Oriental amethyst for the purple; while the water-clear, colorless crystal is known as white sapphire. The process of manufacture of rubies is carried on with the oxyhydrogen blowpipe, to whose intense heat the powdered alumina with its coloring oxides is subjected. Rubies have been thus produced weighing 12 to 15 carats when cut. The average weight of the native Burmese ruby is about one-eighth of a carat. The sapphire and the so-called Oriental stones are prepared in the same manner, with the addition of proper coloring matter. The emerald and opal have not emerged from the experimental stage, although Becquerel, a French chemist, is reported to have produced opals from solutions of silicates with high-tension electric currents. To be distinguished from synthetic gems are reconstructed stones, which (as yet only done with the ruby) are pieces of the natural stone fused together. They are very brittle. The pearl is not produced synthetically, but many imitations exist. The Japanese produce them by fastening a piece of mother-of-pearl in the shells of the pearl-oyster and allowing it to remain there for a number of years. The turquoise, a phosphate of aluminum colored with copper, is not synthetically produced, although various experiments with its manufacture have been made.

Gemsbok (jemz'bok), the *Oryx gazella*, a large and powerful member of the antelope family, inhabiting the plains of South Africa. It equals the domestic ass in size, has a short, erect mane, a long, sweeping, black tail, and long, sharp-pointed, heavy horns, nearly straight from base to tip, and obscurely ringed throughout the lower half. By the aid of these natural bayonets it can easily defend itself from the smaller Carnivora, and it has been known to drive off, and even kill, the lion himself, when attacked by him.

Gendarmes (zhän-därm), the name originally given in France to the whole body of armed men, but after the introduction of standing armies to a body of heavy-armed cavalry, which composed the chief strength of the forces. Gendarmes are now the French armed police. They are all picked men; they are usually taken from the regular forces, and are of tried courage or approved conduct. There are *horse gendarmes* and *foot gendarmes*. They are formed into small parties called *brigades;* and the union of a number of these forms a *departmental company*.

Gender (jen'der), in grammar one of those classes or categories into which words are divided according to the sex, natural or metaphorical, of the beings and things they denote. It may be exhibited by a class of words marked by similarity in termination, the termination having attached to it a distinction in sex, as seen in nouns, adjectives, participles, etc. There are three genders in all: *masculine*, *feminine*, and *neuter*, but these three distinctions only exist in some languages. In Sanskrit, Greek, and Latin all three are present, as also in German and English. English words expressing males are said to be of the *masculine* gender; those expressing females, of the *feminine* gender; and words expressing things having no sex are of the *neuter*, or *neither* gender. Gender is thus coincident with sex in English, and is a very simple matter. But in other languages sex and gender have little or no necessary relation, the majority of the names applied to inanimate objects being either masculine or feminine, and the grounds for such distinction being quite obscure. In the languages derived from the Latin—Italian, French, Spanish, and Portuguese—a neuter gender is not recognized. In the highly inflected languages there are certain terminations distinctive of the different genders, but in English gender only to a slight extent depends on the form of the word—*ess*, for instance, is a feminine termination. In English the gender of a noun only affects the pronoun substituted for it.

Genealogy (je-ne-al'ō-ji), the systematical investigation and exhibition of the origin, descent, and relations of families (or their *pedigree*). Persons descended from a common father constitute a family. Under the idea of *degree* of relationship is denoted the nearness or remoteness of relationship in which one person stands with respect to another. A series of several persons, descended from a common progenitor, is called a *line*. A line is either *direct* or *collateral*. The collateral lines comprehend the several lines which unite in a common progenitor. For illustrating descent and relationship genealogical tables are constructed, the order of which depends on the end in view. The common form of genealogical tables places the common stock at the head, and shows the degree of each descendant by lines. Some tables, however, have been constructed in the form of a tree, in which the progenitor (German, *Stammvater*) is placed beneath, as if for a root.

General (jen'er-al), the commander of an army, or of a division or brigade; the highest military title, with the exception of that of field-marshal. In the United States service there are three ranks, the highest *general*, the second *major-general*, and the lowest *brigadier-general*, the last being immediately above a colonel, as in other services. In Britain three similar ranks exist, their titles being *general, lieutenant-general* and *major-general*. *General*, in the Roman Catholic Church, is the title given to the supreme head, under the pope, of a monastic order. In most of the orders he is elected for three years, or some other fixed term, by the Jesuits for life, but the election must be confirmed by the pope.

General Assembly. See *Assembly (General)*.

Generalization (jen-er-al-i-zā'shun), in logic, is the act of comprehending, under a common name, several objects agreeing in some point which we abstract from each of them, and which that common term serves to indicate.

General Lien (lēn), in law, is the right to retain possession of a chattel until payment be made, not only of any debt due in respect of that particular chattel, but of any balance that may be due on general account in the same line of business. General liens do not exist at common law, but depend entirely upon contract express or

implied from the special usage of dealing between the parties.

General Paralysis, known also as General Paralysis of the Insane, Dementia Paralytica, and Progressive General Paralysis, is a disease due to the progressive destruction of the nerve cells of the brain cortex and to hypertrophy of the supporting connective tissue, and is frequently attended by spinal complications. It occurs most commonly in adult males, and can almost always be traced to syphilitic or alcoholic degeneration. Later research, instituted by the growing frequency of this disease and its serious character, has resulted in the conclusion that it is a parasyphilitic type of disease. The *spirochæta pallida*, the essential germ-organism of syphilis, is present in the central nervous system of a large proportion of the cases of general paralysis, and nearly all of them give a positive Wassermann reaction. The presence of an organism resembling the Klebe-Loeffler bacillus has been detected, and for a time it was held that the disease was due to a bacterial toxin; but this theory has since been abandoned, and it is now believed that if these bacteria play any part in the progress of the malady, it is of secondary importance. The symptoms of general paralysis may be divided into mental, sensory and motor. The mental symptoms are characterized by lack of adjustment, lack of will power, indecision and irritability; also by moral perversions, as indecent exposure, criminal assault, theft and various minor offenses. Among the sensory symptoms, loss of sight and hearing, formications and anesthesias are common. The motor symptoms are marked by the loss of power of expression by speech or in writing, aphasia, irregular gait and a change in the pupillary reflex. The mental defect associated with these departures from the normal may assume various forms, as alternating periods of excitement and depression, with periods in between of a return to the normal state. This is the so-called paralysis of double or circular form. The second group shows a progressively increasing loss of mental power, the memory, business capacity and will power gradually deteriorating, with only slightly marked evidence of depression or excitement. A third group comprises cases of expansive delirium or maniacal excitement. Extravagant delusions as to the wealth and power, and extreme excitement passing into homicidal mania, are distinguishing features of this class. In a fourth group depression associated with loss of memory and with delusions is a marked symptom. All cases gravitate toward dementia. In the early stages of the disease the physical signs may not be marked. But usually the onset of the malady is characterized by stolidity of countenance, tremulous lips, hindered and blurred articulation, associated with a tremor of the hand and arm which interferes with writing, and an ataxic or spastic gait. The patient is also liable to epileptic or apoplectic seizures. The stage of complete paralysis supervenes. The patient is a physical and mental wreck, bed-ridden, utterly helpless, unable to retain fæces or urine. Death results from exhaustion, in coma or convulsions, from heart failure or lung complications. Recovery from general paralysis is at present of rare occurrence, though recoveries have been reported, taking place before the advanced stages were reached.

General Ship, in maritime law, is a ship announced by the owners to take goods from a particular port at a specified time, and which is not under special contract to particular individuals.

General Staff, is that part of army organization which consists of a number of officers selected for their special fitness to aid in carrying out the principles of military procedure as formulated by the general commanding officer. The body of the general staff had its origin in Germany, where a number of officers, not attached to any corps, were appointed to prepare maps, strategical schemes, and statistics regarding the relative strength of armies. It is to be distinguished from the company of general officers surrounding a commander in the field of war. In the United States the General Staff Corps was created by act of Congress, February 14, 1903. It is governed by rules prescribed by the President, and is made up of about fifty officers who are detailed for a period of four years. Their duties consist in studying the efficiency and strength of the army, plans for defense, mobilization and strategic positions (in time of war).

General Theological Seminary, situated in Manhattan Borough, N. Y., and founded in 1817, is the chief seminary of the Protestant Episcopal Church of America. After many years of financial difficulty it was placed on an independent basis by the gifts of Dean Hoffman, who administered its affairs (1878–1902). It has both an ordinary course of three years and a post-graduate course. It confers the degrees of B.D. and D.D., the latter of which is both academic and honorary. No fees are charged for its tuition, and there are many valuable prizes. Its statistics, in 1914, were: faculty, 15; students, 137; library, 58,535 volumes.

Generalization, the act of comprehending under a general name a number of objects which agree in one or more points. The general term stands for the many objects in so far only as they all agree. This process is akin to classification and definition; and the higher form of it is induction.

Generation (jen-er-ā'shun), a single succession of human beings (or animals) who are born, grow up, and reproduce their kind; hence, an age or period of time between one succession and the next, as the third, the fourth, or the tenth generation. The length of a human generation is usually estimated at about thirty years.

Generation. See *Reproduction.*

Generation, ALTERNATE, or METAGENESIS, that kind of multiplication, seen in some invertebrate animals or even in plants, in which parents produce progeny unlike, sometimes extremely unlike, themselves, while this unlike progeny give rise to others resembling the original forms. Sometimes there are more than one unlike form between these like forms. The Hydrozoa abundantly illustrate this phenomenon, also the Echinoderms, Polyzoa, Tunicata, the wheel animalcules, Nematoid worms, flatworms, tapeworms, several of the true Annelids among Crustaceans, Daphnia, the Phyllopods among Insects, the plant-lice. The steps may be seen in certain of the Hydroid Polyps, thus: (1) There is an ovum or egg, free-swimming and impregnated. (2) This ovum attaches itself to a fixed submarine object, and develops into an organized animal. (3) This organism produces buds or zooids, often of two kinds—one set nutritive, the other generative—unlike each other and unlike their parent, the whole forming a hydroid colony. (4) The generative set mature eggs, which on being liberated become the free-swimming ova (No. 1), and the cycle is renewed. A somewhat similar phenomenon is that of *Parthenogenesis* (which see).

Generation, SPONTANEOUS, or ABIOGENESIS, the doctrine that living matter may originate spontaneously, 'that under certain circumstances dead matter may build itself up into living matter without the intervention of already existing protoplasm.' In the 17th century this was the dominant view, sanctioned alike by antiquity and authority, and was first assailed by Redi, an Italian philosopher. Buffon held the doctrine in a very modified degree. He held that life is the indefeasible property of certain indestructible molecules of matter which exist in all living things, and have inherent activities by which they are distinguished from non-living matter. Of course it is only animals or plants of very low type and minute size that have been supposed to be produced spontaneously, and the readiness with which such appear lends plausibility to the theory. Experiments of recent date, moreover, seem to point to the spontaneous origin of life. Dr. H. Charlton Bastian and others claim that they succeeded in obtaining living organisms from certain chemical solutions. Dr. Edward A. Schafer, of the British Association for the Advancement of Science, points out that biology tends to obliterate the line between living and non-living matter.

Generator. See *Dynamo.*

Generic Name (je-ner'ik), in natural history, the denomination which comprehends all the species of a genus; thus *Canis* is the *generic* name of animals of the dog kind; *Felis*, of the cat kind; *Cervus*, of the deer kind. See *Genus.*

Genesee (jen-e-sē'), a river of the United States, which rises in Pennsylvania, flows north through New York, and falls into Lake Ontario 6 miles below Rochester, after a course of 145 miles. It is notable for its varied and romantic scenery, and its extraordinary falls. These falls are five in number: three of them occur about 90 miles from the mouth of the river, and are respectively 60, 90 and 110 feet high. The other two are near Rochester, and are both about 100 feet high.

Genesis (jen'e-sis; Greek, creation, birth, origin), the first book of the Bible and of the Pentateuch, named in the Hebrew canon *B'reshith* ('In the *Beginning*'), from the term with which it commences. From the Greek translators it received the name it is now commonly known by. Genesis consists of two great but closely connected divisions:—(1) The history of the creation, the fall of man, the flood, the dispersion of the human race, chap. i-xi. (2) The history of the fathers of the Jewish race, chap. xii-l. A certain apparent difference of style and language, the occurrence of what seem gaps on the one hand, and repetitions and contradictions on the other, and the different use of the term for the divine name (*Jehovah*, Everlasting; and *Elohim*, Almighty), led very early to the question of the integrity of the book, and various critics declare that larger or smaller interpolations have been made in the original text.

Genet (jen'et), a digitigrade carnivorous mammal of the family Viverridæ. The genus *Genetta* contains five species, the best known of which is the *G. vulgāris*, the common genet, whose range extends all around the Mediterranean, including Western Asia, Northern Africa, and Southern Europe. It is about the size of a small cat, but of a longer form, with a sharp-pointed snout, upright ears, and a long tail. It has a beautiful soft fur, and, like the civet, produces an agreeable perfume. The habits of the genet are like those of the weasel tribe; it is easily tamed, and is sometimes employed in Constantinople and elsewhere to catch rats and mice.

Geneva (je-nē'va; German, *Genf*; French, *Genève*), a town of Switzerland, capital of the canton of the same name, situated at the western extremity of the Lake of Geneva, where the Rhône issues, here crossed by several bridges, and dividing the town into two portions, the larger and more important of which is on the left or south bank. The environs are covered with handsome villas, and the town itself, when approached either by land or water, has a very attractive appearance. It was formerly surrounded by walls and regular fortifications, but since 1850 these have been removed. The town is divided into two parts, an upper and a lower. The upper town, occupied chiefly by the wealthier citizens, consists of well built houses and handsome hotels; the lower town, the seat of trade and residence of the poorer classes, consists largely of houses remarkable for their height, and lining narrow, irregular, dark, and ill-cleaned streets; but great improvements have recently been carried out. The more important public buildings are the cathedral or Church of St. Pierre, a Gothic structure of the 10th, 11th, and 12th centuries, occupying the highest site in the town, and by its three towers forming the most conspicuous object within it, somewhat defaced externally by a very incongruous Greek peristyle; the town-house in the Florentine style; the Musée Rath containing a collection of pictures and other works of art; the university building, nearly opposite the botanic garden, rebuilt in 1867-71, and containing the public library, founded by Bonivard, the prisoner of Chillon, in 1551, and now numbering 90,000 vols.; and the museum of natural history. The only important manufactures of Geneva are those of watches, musical boxes, and jewelry, for all of which the town is justly famed. Geneva has ample railway communication, and is one of the principal entrances for tourists and travelers into Switzerland. In literature and science Geneva has long occupied a distinguished place, and it has been the birthplace or the residence of many eminent men, including Calvin, Beza, Knox, Le Sage, Necker, De Candolle, Rousseau, Sismondi, etc. Geneva early adopted the principles of the Reformation, and chiefly through the teaching of Calvin, the town acquired an important influence over the spiritual life of Europe, and became the center of education for the Protestant youth of Britain, France, and Germany. Pop. 105,710.—The canton is bounded by the canton of Vaud and the Lake of Geneva, and by France. Area, 109 sq. miles. It belongs to the basin of the Rhône, and the only streams of importance are that river and the Arve, which joins it a little below the town of Geneva. The soil has been so much improved by skillful and preserving culture that abundant crops of all kinds suitable to the climate are raised, and the whole territory wears the appearance of a garden. Manufactures consist chiefly of clocks and watches, musical boxes, mathematical instruments, gold, silver, and other metal wares, woolen cloths, and silk goods of various descriptions, hats, leather, and articles in leather; and there are numerous cotton mills, calico printing works, and dye works. The territory of Geneva having, by the arrangements of the Congress of Vienna, obtained an accession of fifteen communes, detached from France and Savoy, was admitted a member of the Swiss Confederation in 1814, and ranks as the twenty-second canton. Its constitution of 1848 is the most democratic in the federation. All religious denominations are declared to have perfect freedom, but two of them are paid by the state—the Roman Catholics, amounting to rather more than a third of the population, and the Protestant National Church. The language spoken is French. Pop. 132,609.

Geneva. See *Gin*.

Geneva, a city of Ontario County, New York, on Seneca Lake, midway between Syracuse and Rochester, on the Lehigh Valley and New York Central railroads. It has various manufacturing industries and extensive nurseries, and is the site of a state experiment station, and of Hobart College. Pop. 12,446.

Geneva, LAKE OF, or LAKE LEMAN (Latin, *Lacus Lemanus*), the largest of the Swiss lakes, extending in the form of a crescent, with its horns pointing southward, between France on the south, and the cantons of Geneva,

Vaud, and Valais: length, measured on its north shore, 55 miles, and on its south shore, 40 miles; central breadth, about 6 miles; area, 331 sq. miles; greatest depth, 900 feet. It is 1150 feet above the sea. On the north the shore is low, and the ground behind ascends gradually in beautiful slopes. On the south, and particularly at the east end, the shore is rocky and abrupt, and lofty precipices often rise sheer from the water's edge. It contains various species of fish, and its water is remarkably pure and of a beautiful blue color. The Rhône, which enters its eastern extremity a muddy turbid stream, issues from its western extremity perfectly pellucid, and likewise of the finest blue.

Geneva Arbitration. See *Alabama (The)*.

Geneva Bible, a copy of the Bible in English, printed at Geneva; first in 1560. This copy was in common use in England till the version made by the order of James I was introduced, and it was laid aside by the Calvinists with reluctance. It was the first which divided the text into verses and the first to omit the apocrypha. From its stating (Gen., iii, 7) that our first parents made themselves 'breeches,' it is sometimes known as the Breeches' Bible.

Geneva Convention, an agreement concluded at an international conference held in Geneva in 1864, for the succor of the sick and wounded in time of actual warfare. The neutrality of hospitals, ambulances, and the persons attending on them was provided for; and the use of the red cross on a white ground as a sign of neutrality has received the adhesion of all civilized powers. Those wearing it are known as the Red Cross Society (*q. v.*).

Geneviève (jen'e-vēv, *Fr.* zhĕn-vi-āv), the name of two female saints.—1. St. Geneviève, the patron saint of Paris; born at Nanterre, about 5 miles from Paris, in the year 423; died at Paris about the beginning of the 6th century. She devoted herself while yet a child to the conventual life. Her prayers and fastings are credited with having saved Paris from the threatened destruction by Attila in 451. Many legends are told respecting her, and several churches have been dedicated to her. Her festival is held on the 3d January.—2. St. Geneviève, by birth Duchess of Brabant, wife of Siegfried, count palatine in the reign of Charles Martel (about 750). According to the legend, which is the subject of several tales and dramas, she was accused of adultery during her husband's absence and condemned to death; but was allowed to escape, and she lived six years in a cavern upon nothing but herbs. She was finally found, and carried home by her husband, who in the meantime had become convinced of her innocence.

Genghis Khan, or JENGHIS KHAN (jen'gis), a Mongol conqueror, born about 1160; died 1227. His father was chief over thirty or forty clans, but paid tribute to the Tartar khan. He succeeded his father when only fourteen years of age, and made himself master of the neighboring tribes. A great number of tribes now combined their forces against him, but he found a powerful protector in the great Khan of the Karaite Mongols, Oung, or Ung, who gave him his daughter in marriage. After much internecine warfare with various Tartar tribes and many victories Genghis was proclaimed Khan of the United Mongol and Tartar tribes. He now professed to have a divine call to conquer the world, and the idea so animated the spirit of his soldiers that they were easily led on to new wars. The country of the Uigurs, in the center of Tartary, had long excited his ambition. This nation was easily subdued, and Genghis Khan was now master of the greatest part of Tartary. Leading his tribes to conquest in 1209, he passed the great wall of China, the conquest of China occupying him more than six years. The capital, then called *Yenking*, now *Peking*, was taken by storm in 1215 and plundered. The murder of the ambassadors whom Genghis Khan had sent to the King of Kharism (now Khiva) led to his invasion of Turkestan in 1218 with an army of 700,000 men and the two cities of Bokhara and Samarcand were stormed, pillaged, and burned. Seven years in succession was the conqueror busy in the work of destruction, pillage, and subjugation, and extended his ravages to the banks of the Dnieper in Europe. In 1225, though more than sixty years old, he marched in person at the head of his whole army against the king of Tangut (Southwestern China), who had given shelter to two of his enemies, and had refused to give them up. A great battle was fought, in which the King of Tangut was totally defeated with the loss of 300,000 men. The victor remained some time in his newly subdued provinces, from which he also sent two of his sons to complete the conquest of Northern China. At his death his immense dominions were divided among his four sons.

Genii (jē'ni-ī). See *Genius*.

Genipap (jin'i-pap: *Genipapo*, the Guiana name), the fruit of a South American and West Indian

tree, the *Genipa Americana*, nat. order Rubiaceæ. It is about the size of an orange, and of a pleasant vinous flavor.

Genista (jin-is'ta), a genus of leguminous plants, comprising about 100 species, one of which is the *Planta genista*, the *Plante genêt*, from which the Plantagenets took their name. The *Genista tinctoria*, or dyer's broom, so called, as it was formerly much employed by dyers, who obtained a good fixed yellow or orange color from it, is frequent in England and the lowlands of Scotland.

Genitive Case (jen'i-tiv), in grammar, a case in the declension of nouns, adjectives, pronouns, participles, etc., expressing source, origin, possession, and the like. In English grammar the corresponding case is the possessive case.

Genius (jē'nyus), a tutelary deity; the ruling and protecting power of men, places, or things; a good or evil spirit supposed to be attached to a person and influence his actions. The Genii of the Romans were the same as the *Daimŏnes* (Demons) of the Greeks. According to the belief of the Romans, which was common to almost all nations, every person had his own Genius; that is, a spiritual being, which introduced him into life, accompanied him during the course of it, and again conducted him out of the world at the close of his career. The Genii of women were called *Junones*. The Genii were wholly distinct from the *Manes*, *Lares*, and *Penates*, though they were allied in one important feature—the protection of mortals.

The term *genii* (with the singular *genie*) is also used as equivalent to the *jinn* (singular *jinnee*) of Arabic tales. These are supposed to be a class of intermediate beings between angels and men. See *Jinn*.

Genlis (zăn-lēs), Stéphanie Félicité Ducrest de St. Aubin, Countess de, a French authoress, born near Autun 1746; died at Paris 1830. At four years of age she was admitted as a canoness into the noble chapter at Aix, and at seventeen married the Count de Genlis. By this marriage she became niece to Madame de Montesson (who had been privately married to the Duc d'Orleans), and obtained through her the place of lady-in-waiting to the Duchesse de Chartres. In 1782 the Duc de Chartres (Philippe Egalité) appointed her governess of his children. She obtained great influence over her employer, and was the object of no little scandal in her relations with him, which was strengthened by the mysterious appearance of an adopted daughter, afterwards known by the name of Pamela, who married Lord Edward Fitzgerald. At this time she published several works on education, etc. On the breaking out of the Revolution she retired for a while to Switzerland, and then to Altona. In 1800 she returned to France, gained the favor of Napoleon, who gave her a pension. From that time she resided constantly in Paris. Her works, which embrace a wide variety of subjects, amount altogether to about ninety volumes, and include some of the standard novels in the French language. Her voluminous *Mémoires*, written when she was upwards of eighty years of age, abound in scandal, and are full of malignant attacks upon her contemporaries.

Gennesaret (jen-es'a-ret), Sea of. See *Galilee* (*Sea of*).

Genoa (jen'o-a; Ital. *Genŏva*, '*La superba*'), a seaport of N. Italy, the chief commercial city of the kingdom, on the coast of the Mediterranean, at the head of the gulf of the same name, 75 miles S. E. of Turin. It is beautifully situated at the foot and on the slope of the Ligurian Alps, the lower hills of which form a background to the city. It is enclosed by extensive fortifications, and the heights around are crowned with detached forts. It has a most imposing effect when approached either by land or sea. In the older parts of the town the streets are extremely narrow, with lofty buildings on either side. In the newer quarters many of them are spacious, and are lined with palaces and other noble edifices. Some of the palaces are filled with works of art by the greatest masters. The principal are—the Ducal palace (now containing the law courts and various public offices), the Palazzo del Municipio or town-hall, the Palazzo Brignole or Rosso (with the largest picture gallery in Genoa), the Palazzo Pallavicini, the Palazzo Reale, built in the sixteenth century for the Durazzo family, was purchased in 1815 by the royal family, and the palaces of Doria, Serra, Cambasio, Balbi, and Durazzo. The most remarkable of the churches is the Duomo, or Cathedral of St. Lorenzo, founded in the eleventh century, but not completed till the beginning of the twelfth; S. Maria in Carignano, built in imitation of the original plan of St. Peter's at Rome; S. Stefano, a Gothic church, the oldest parts of which date from the end of the twelfth century; S. Ambrogio, containing two paintings by Rubens and the Assumption of Guido Reni. The principal charitable institution is the Albergo de' Poveri, in which 1600 individuals, orphans and old people,

find shelter. Others are the Ospedale del Pammatone founded in 1430; and a hospital recently built by the Galliera family. Among the theaters of the city may be mentioned the Teatro Carlo Felice, an elegant structure, with a splendidly fitted up interior. Besides the university, founded in 1775, the chief educational institutions are the theological seminary, the school of fine arts, the royal marine school, and the navigation school. The building of the Bank of St. George, one of the most ancient banks of circulation and deposit in Europe, is now used as a custom-house. In one of the open spaces there is a fine marble statue of Columbus, with accompanying allegorical figures. The Campo Santo, or

Strada Balbi, Genoa.

cemetery, about 2½ miles from the city, is one of the most beautiful burial grounds in Europe. It contains fine mortuary buildings and much statuary in white marble. The manufactures of Genoa include cotton and silk goods, gold, silver, paper and leather goods, sugar, and preserved fruits. The old harbor, which is of a semicircular form and about ¾ mile in diameter, is formed by two moles projecting into the sea from opposite sides; there are now also two outer or additional harbors formed by moles recently constructed. The principal articles of export are cereals, oils, fruit, cheese, rags, the products of its manufactures, etc. Many emigrants embark here. Imports—cotton, wool, wheat, sugar, coffee, coal, hides, iron, etc.

Under the Romans Genoa was famous as a seaport. After the breaking up of the empire of Charlemagne, it constituted itself a republic, presided over by doges. From 1119 it was almost constantly at war with Pisa down to 1284, when Genoa inflicted a crushing defeat on Pisa. The Genoese obtained the supremacy over Corsica, and nominally over Sardinia, possessed settlements in the Levant, on the shores of the Black Sea, on the Spanish and Barbary coasts, and had a very flourishing commerce. The rivalry between Genoa and Venice was a fruitful source of wars during the 12th-14th centuries. Meanwhile the city was internally convulsed by civil discord and party spirit. The hostility of the democrats and aristocrats, and the different parties among the latter, occasioned continual disorder. From the contests of noble rivals, in which the names of Doria, Spinola, Grimaldi, and Fieschi are prominent. Genoa was drawn into the Guelph and Ghibelline contest. In the absence of internal tranquillity the city sometimes submitted to a foreign yoke in order to get rid of anarchy. In the midst of this confusion St. George's Bank was founded. It owed its origin to the loans furnished by the wealthy citizens to the state, and was conscientiously supported by the alternately dominant parties. In 1528 the disturbed state regained tranquillity and order, which lasted till the end of the eighteenth century. The form of government established was a strict aristocracy. The nobility were divided into two classes—the old and new. To the old belonged, besides the families of Grimaldi, Fieschi, Doria, Spinola, twenty-four others, who stood nearest them in age, wealth, and consequence. The new nobility comprised 437 families. By little and little Genoa lost all her foreign possessions. Corsica, the last of all, revolted in 1730, and was ceded in 1768 to France. After the battle of Marengo (1800) Genoa was taken possession of by the French. In 1805 it was formally annexed to the Empire of France, in 1815 to the Kingdom of Sardinia, with which it has become a portion of the Kingdom of Italy. Pop. (1911) 272,221.

Genoa, Gulf of, a large indentation of the Mediterranean, in North Italy, at the head of which lies the city and port of Genoa. No precise points can be named as marking its entrance; but it may, perhaps, be generally said to comprise the entire space north of lat. 43° 40′ N.

Genre-painting (zhän-r), that department of painting in which are depicted scenes of everyday life, in opposition, for instance, to historical painting, in which historic personages are exhibited, or to landscape.

Gens (jens), in Roman history, a clan or stock embracing several families united together by a common name and certain religious rites; as, the Fabian *gens*, all having *Fabius* as part of their personal name; the Julian *gens*, all named Julius; the Cornelian *gens*, etc.

Gens D'Armes. See *Gendarmes*.

Genseric (jen'sẽr-ik), a king of the Vandals, who, having obtained joint possession of the throne of Spain with his brother Gonderic, crossed the Straits of Gibraltar with 50,000 men, A.D. 429, on the invitation of Bonifacius, the Roman governor of Africa, to assist him against the Moors. He, however, soon declared his independence, and, having completely defeated Bonifacius, founded a kingdom, which, in 439, had its seat at Carthage. He collected a powerful fleet, ravaged the coasts of Sicily and Italy, and in 455 took and sacked Rome. Two unsuccessful attempts were made by the Eastern and Western emperors to overthrow his power, but Genseric secured all his conquests, and, notwithstanding all his cruelties, was permitted to die in peace A.D. 477.

Gentian (jen'shan), the name given to the members of the genus *Gentiāna* (order Gentianaceæ), a large genus of bitter herbaceous plants, having opposite, often strongly ribbed, leaves, and blue, yellow, or red, often showy flowers. The calyx consists of four or five valvate segments, and the corolla is four or five parted; the fruit is a two-valved, one-celled, many-sided capsule. They are for the most part natives of hilly or mountainous districts in the northern hemisphere. The most important species is *Gentiāna lutĕa*, a native of Switzerland and the mountainous parts of Germany. The root has a yellowish brown color and a very bitter taste, and is imported into the United States in considerable quantities, where it is used medicinally, and also as an ingredient of cattle foods. In Switzerland and Bavaria a liqueur called Enziangeist or 'gentian-spirit' is made from it. Many of the blue-flowered species, as *G. acaulis*, *G. nivālis*, and *G. verna*, are among the most conspicuous and ornamental of European Alpine plants. America has several attractive species.

Yellow Gentian (*Gentiana lutĕa*).

Gentianaceæ (jen-shan-ā'se-ē), the gentians, an order of monopetalous exogens, consisting mostly of annual or perennial herbaceous plants, with opposite often connate entire leaves, and yellow, red, blue, or white flowers, which are borne in dichotomous or trichotomous cymes or in globose terminal heads. All are characterized by their bitter principle. The order contains about 520 species, which are widely dispersed throughout the world, occurring most plentifully in temperate mountainous regions. Some very handsome species are tropical, while a few occur in Arctic latitudes.

Gentile (jen'tīl), in Scripture, any one belonging to the non-Jewish nations and not a Christian; a heathen. The Hebrews included in the term *goim*, or nations, all the tribes of men who had not received the true faith, and were not circumcised. The Christians translated *Goim* by the L. *gentes*, nations, and imitated the Jews in giving the name *gentiles* to all nations who were not Jews or Christians. In civil affairs the denomination was given to all nations who were not Romans.

Gentleman (jen'tl-man), in English law, every man above the rank of yeomen, including noblemen; in a more limited sense, a man who without a title bears a coat of arms, or one who is 'a gentleman by reputation,' through belonging to some liberal profession or holding some office giving him this rank. In the United States it properly indicates a man of gentle or refined manners, but has lost this sense in its very general application.

Gentlemen-at-Arms, a body of forty gentlemen, headed by a captain, lieutenant, and standard-bearer, whose duties are to form a bodyguard to the British sovereign on state occasions. The corps was established by Henry VIII in 1509, under the name of the Band of Gentlemen Pensioners. Appointments to the corps are made by the sovereign, from a special list of retired officers kept by the commander-in-chief.

Gentoo (jen-tō'), a term applied by old writers to a native of Hindustan, or to the language.

Gentz (gents), Friedrich Von, a German diplomatist and publicist, born 1764; died 1832. He was

secretary to the directory of finances at Berlin when the French Revolution broke out, of which he was an ardent opponent. He served alternately in the Prussian and Austrian civil service, and his pamphlets and manifestoes proved formidable obstacles to the invasions of Napoleon. He took part in the congresses of Vienna and Paris, as well as in others. Among his various works was a life of *Mary, Queen of Scots.*

Genuflexion (jen-ū-flek'shun; from the Latin *genu*, knee, and *flectere*, to bend), the act of bending the knees in worship. There are frequent allusions to genuflexion in the Old and New Testaments, and it would appear that the use was continued among the early Christians. Genuflexion obtains, both by rule and prescription, in various places in the offices of the Roman Catholic Church, and at different parts of the services of the Church of England.

Genus (jē'nus), in scientific classification, an assemblage of species possessing certain characters in common, by which they are distinguished from all others. It is subordinate to *order, tribe,* and *family.* A single species, possessing certain peculiar characters which belong to no other species, may also constitute a genus, as the giraffe.

Geodes (jē'ōdz), round hollow nodules, containing sometimes earthy matters, sometimes a deposit of agate, sometimes quartz and spars crystallized. They are found more or less in all volcanic rocks, and have been formed by water depositing their materials in the hollows of those rocks.

Geodesy (jē-od'e-si), the science of surveying extended to large tracts of country; the branch of applied mathematics which determines the general figure and dimensions of the earth, the variations of the intensity of gravity in different regions, etc., by means of direct observation and measurement. See *Trigonometrical Survey.*

Geoffrey of Monmouth (jef'rā; called also *Geoffrey ap Arthur*), an ecclesiastic and historian of the twelfth century. He sprang from the Norman settlers in Wales; became archdeacon of Monmouth, whence he was, in 1152, raised to the bishopric of St. Asaph. He died in 1154. His famous history was first published in 1128. This *Chronicon sive Historia Britonum* is now known to be, as the compiler states, chiefly a translation from an ancient book in the Breton tongue, discovered by Walter Calenius, an archdeacon of Oxford. It contains a pretended genealogy of the kings of Britain from the time of the fabulous Brutus, or Brute, the Trojan, to the death of Cadwallader, King of Wessex, in 688. It was soon translated into French, English, and Welsh, and became a great source of romance to the writers of successive generations.

Geoffroy St. Hilaire (zhof-rwȧ saṇ tē-lār), ETIENNE, a French naturalist, born in 1772; died in 1844. He was educated at the colleges of Navarre and Lemoine, and became a favorite pupil of Haüy. At the age of twenty-one he obtained the chair of zoology in the Parisian Jardin des Plantes. As a member of the Egyptian expedition in 1798 he founded the Institute of Cairo, and returned about the end of 1801 with a rich collection of zoological specimens. In 1807 he was made a member of the Institute, and in 1809 professor of zoology at the Faculty of Sciences. He devoted himself especially to the philosophy of natural history. The fundamental idea brought conspicuously forward in all his works is, that in the organization of animals there is only one general plan, one original type, which is modified in particular points so as to present differences of genera. This view met with strong opposition from Cuvier. Among his principal works are *Sur le Principe de l'Unité de Composition Organique; Philosophie Anatomique; Histoire Naturelle des Mammifères,* written in conjunction with Cuvier, and *Notions de Philosophie Naturelle* (1838).

Geoffroy St. Hilaire, ISIDORE, physiologist and naturalist, son of the preceding, was born at Paris in 1805; died in 1861. He devoted himself to natural history, and in 1824 was appointed assistant to his father at the Jardin des Plantes. He was elected to the Academy of Sciences in 1833, and afterwards became successively inspector-general of the university, member of the council of public instruction, and professor of zoology at the Academy of Sciences. One of his chief works, *Histoire Générale et Particulière des Anomalies de l'Organisation chez l'Homme et les Animaux,* adds valuable confirmation to the theories of his father. He was the means of founding the Acclimatization Society of Paris.

Geognosy (jē-og'nu-si), a term which originated among the German mineralogists, and is nearly synonymous with *geology.* It is the science of the substances which compose the earth or its crust, their structure, position, relative situation and properties.

Geographical Societies

(jē-o-grof'-i-kal) are associations formed with the view of obtaining and disseminating geographical knowledge. Of these, the first was founded in Paris in 1821; the second, the Royal Geographical Society of England, in 1830; the American Geographical Society at New York in 1852, and others elsewhere at various dates. The National Geographic Society, founded at Washington in 1888, has an enormous membership, numbering considerably over 100,000 due to the circulation of its richly illustrated monthly magazine.

Geography

(jē-og'-ra-fi; from the Greek *gē*, earth, and *graphō*, I write), the science which treats of the world and its inhabitants, giving an account of the earth as a whole, and of the divisions of its surface, natural and artificial, describing the different countries, states, provinces, islands, cities, etc. It may be regarded as embracing several departments or branches. *Mathematical Geography* is that branch of the general science which is derived from the application of mathematical truths to the figure of the earth, and which determines the relative positions of places, their longitudes and latitudes, the different lines and circles imagined to be drawn upon the earth's surface, their measurement, distance, etc. *Physical Geography* treats of the physical condition of the earth, its great natural divisions of land and water, the atmosphere, and the movements of oceanic and aërial currents; the geological structure of the earth; and the natural products of the earth, vegetable and animal. It is concerned chiefly with general laws and principles, as they are manifested upon a grand scale, and in the organic kingdom with the existence of groups of animals and plants. This branch approaches at various points the sciences of geology, hydrology, meteorology, botany, zoology, and ethnology. *Political Geography* embraces the description of the political or arbitrary divisions and limits of empires, kingdoms, and states; and treats of their government, laws, social organizations, etc. *Commercial Geography* has to do with the distribution of the products of the earth or the workship between different nations.

The earliest idea of the earth formed by mankind seems to have been that it was an immense disc, in the center of which their own land was situated, surrounded by the ocean, and covered by the sky as with a canopy. The Phœnicians were the first people who made any great progress in extending the bounds of geographical knowledge. They seem to have explored all the shores of the Mediterranean, and at an early period to have passed the Pillars of Hercules (by the Strait of Gibraltar), and visited to some extent the Atlantic shores of Europe and Africa, extending their voyages as far north as Britain, and as far south as the Tropic of Capricorn. In the Homeric poems (which may be regarded as representative of the ideas entertained by the Greeks about the commencement of the ninth century B. C.) the earth is supposed to resemble a circular shield surrounded by a belt of water which was the source of all other streams. The world of Herodotus (born 484 B.C.) extended from the Atlantic to the western boundary of Persia, and from the Red Sea or Indian Ocean to the amber lands of the Baltic. The Indian expedition of Alexander the Great (330 B.C.) greatly enlarged the ancient knowledge of Northern and Eastern Asia. About 320 B.C. Pytheas, a seaman of Massilia (ancient Marseilles), a Greek colony, sailed along the western coasts of Spain and Gaul, visited Britain, and, pursuing his voyage, discovered an island, henceforward famous as *Ultima Thule*, which is supposed to have been Iceland. Eratosthenes (276-196 B.C.) first used parallels of latitude and longitude, and constructed maps on mathematical principles. He considered the world to be a sphere revolving with its surrounding atmosphere on one and the same axis, and having one center. The *Geography* of Strabo, a Greek of Pontus, written about the beginning of the Christian era, embodies all that was known of the science at that period. The countries lying round the Mediterranean were known with tolerable accuracy, but the Atlantic shores of Europe were very vaguely comprehended, while of the northern and eastern portions the most erroneous notions prevailed. Pomponius Mela, an early Roman geographer, wrote about the time of the Emperor Claudius. He divided the world into two hemispheres, the Northern or known and the Southern or unknown; the former comprising Europe N. of the Mediterranean and W. of the Tanais (Don); Africa S. of the Mediterranean and W. of the Nile; and Asia. The next famous geographer is Ptolemy, who lived at Alexandria about the middle of the second century A.D. In Europe, Spain and Gaul were now correctly delineated, together with the southern shores of Britain. Northern Germany and the southern shores of the Baltic were pretty well known, as also some portion of Russia in the neighbor-

hood of that sea, and the southern part of European Russia. In Asia it was considered certain that there were wide regions inhabited by nomadic tribes called Scythians, while from the far east came some vague reports of China. The *Geography* of Ptolemy remained the acknowledged authority during the whole of the middle ages. From his time up till the thirteenth century no advance was made in geographical knowledge until Marco Polo opened up new fields of inquiry. The account of his travels first made known to Europe the existence of Japan and of many of the East Indian islands and countries. Then followed the discovery of America in 1492, and from this time forward the progress of discovery was extremely rapid. In 1497 the Cape of Good Hope was doubled by Vasco da Gama, four years after its discovery by Bartholomew Diaz. Within thirty years from the date of the first voyage of Columbus the whole of the east coast of America from Greenland to Cape Horn had been explored. In 1520 Magellan passed the straits which bear his name, and his vessel, crossing the Pacific and Indian Oceans, returned to Europe by way of the Cape of Good Hope, being the first that had circumnavigated the globe. The west coast of America was explored as far as the Bay of San Francisco about the middle of the sixteenth century. At the same time discovery in the east advanced with rapid strides. Within twenty years of Gama's arrival in India the coasts of East Africa, Arabia, Persia, and Hindustan had been explored, and many of the islands of the great Archipelago discovered. The expeditions of Willoughby and Frobisher in 1553 and 1576, of Davis in 1585, of Hudson in 1607, and of Baffin in 1616, though they failed in their object of finding a N. W. passage to India, materially enlarged our knowledge of the Arctic regions. By the middle of the seventeenth century the Dutch, under Tasman and Van Diemen, made the Australasian Islands known to the world. Late in the following century Captain Cook added largely to geographical knowledge by his survey of the Pacific and its innumerable islands. The Antarctic continent was discovered in 1840 by American, English, and French expeditions, and the northwest passage round North America was found by McClure in 1850. The travels of Humboldt, Spix and Martius, Lewis and Clark, Fremont, and others have made us acquainted with the general features of the American continent. In Asia numerous travelers have contributed much to render our knowledge certain and precise in respect to a great part of the continent. The interior of Australia has been explored by Sturt, Eyre, Leichhardt, Burke, Wills, King, McDouall Stuart, etc. The opening up of the African interior was materially advanced by the explorations of a host of travelers, including Bruce, Park, Denham, Clapperton, the Landers, Burton, Speke, Grant, Baker, Barth, Livingstone, Rohlfs, Schweinfurth, Cameron, Stanley, etc., and now is almost as well known as that of Europe and America. Within the present century great advances have been made in Arctic geography, the site of the North Pole having been reached in 1909 and that of the South Pole in 1911. The progress which has marked recent discovery has been materially assisted by the governments of various countries, and by the numerous geographical societies formed during the nineteenth century. The scientific study and teaching of geography are becoming more and more recognized to be of high importance, and in both at present Germany takes the lead. See also *Geographical Societies*, the articles on the different countries, and such articles as *Earth*, *Climate*, etc.

Geok Tepe (gök-te'pe), a town and fortress of Central Asia, oasis of the Akhal-Tekke-Turkomans, lon. 58° E., lat. 38° N. In 1879 the Russians under General Lomakine were defeated here with heavy loss, but in January, 1881, it was stormed by General Skobeleff after a three weeks' siege, when about 8,000 fugitives were massacred, no quarter being given.

Geological Surveys (jē-ol-oj'i-kal). Active efforts have been made by the states of this country to obtain a just idea of their geological conditions, the first movement being made by North Carolina in 1823, followed by Massachusetts in 1830, and by 11 more states in the succeeding decade, while by the end of the century nearly all the states had entered upon a systematic investigation of their rocks and minerals. Pennsylvania, New York, New Jersey, and some of the Eastern states did this work with a large degree of completeness. The United States government early entered upon similar work, sending out numerous expeditions, and a United States Geological Survey was organized in 1879, which diligently continued the work, its field of operations embracing the whole country. Great Britain was the first country in Europe to engage in a similar work, beginning in 1832. It has been followed by nearly all the countries of Europe and by its several colonies.

Geology (jē-ol'ō-ji; Gr. *gē*, the earth, *logos*, a discourse) is the science which treats of the history of the earth, as ascertained by the study of its exterior or crust, investigating the successive changes which have taken place in the rock-masses composing it, their relations, structure and origin, and discussing also the main features of the animal and vegetable life of the past as bearing on the earth's history. The present condition and conformation of the earth is the result of vast changes in the past and of agencies working through

Section of River Terraces, showing Successive Levels of Flood Plains.

immense periods of time, and the same or similar agencies may still be seen at work producing similar changes. Thus rocks, both aqueous and igneous, are still being formed. The former receive their name from owing their origin mainly to water, which acts both chemically and mechanically on the crust of the earth, in wearing down rocks and soils and carrying the débris often to considerable distances. The sediments thus carried to sea, or into lakes and estuaries, are spread abroad in the water, and form stratified deposits, which in course of time solidify into rock. With sufficient time all land would thus be eventually degraded beneath the sea, were it not that the loss is compensated by disturbance and elevation of land always slowly taking place over great portions of the continents and islands of the world. Such disturbances have produced strange phenomena among the stratified rocks, which may be contorted, tilted up, dislocated, or otherwise changed in their original arrangement. The strata resulting from aqueous deposits are consolidated (petrified) chiefly by pressure and chemical decomposition and recomposition. Some formations are many thousands of feet in thickness. Contraction of the crust of the earth due to radiation of the heat of the earth into space has also had immense effects, the result being that over broad areas rocky masses have been contorted and compressed to a great degree, and mountain ranges upheaved.

Igneous rocks also form a considerable portion of the visible crust of the earth, though much smaller in amount than those of sedimentary origin. Some of the igneous rocks consist of beds of volcanic ashes, others of old lavas, others of masses of matter which were introduced in a melted state from below among the strata. Granite is the most important and widely-spread of the igneous rocks, and is generally regarded as the fundamental rock of the earth's crust. Rocks that have been melted are known to be igneous by their structure, and also by the effects they have produced on the strata with which they are associated. Shales, sandstones, etc., are often hardened, bleached, and even vitrified at the points of junction with greenstone, basaltic, and felspathic dykes, or old lava beds, and the same kind of alteration takes place on a greater scale when large masses of igneous rocks have been intruded on the strata.

That the rocks which form the crust of the earth had the same general origin with the igneous rocks and sedimentary strata now forming has been well established, and that there is a regular succession of strata from the older to the newer, the oldest being normally lowermost, the newest uppermost, is also well ascertained. A corresponding succession in regard to the animal and vegetable life of former ages has also been proved by the fossils that accompany the successive strata. This *superposition of strata* and *the succession of life in time* are two cardinal doctrines in geology. Observation and experiment alike establish the doctrine of superposition. Thus at the edges of the strata on which London stands the rocks known as the Woolwich and Reading beds are *seen* to lie on the chalk. Far within these edges well-sinkers are aware that often after sinking several hundred feet through the London clay the chalk is reached. In like manner proceeding westward across the middle of England, it is found that

Section of Submarine Plain.

l, Land cut into caves, tunnels, sea-stacks, reefs and skerries by the waves, and reduced to a platform below the level of the sea (*s s*) on which the gravel, sand, and mud (*d*) produced by the waste of the coast may accumulate.

the Chalk rests on the Greensands, the Greensands on the Upper Oolites, the Lower Oolites on the Lias, the Lias on the New Red marl, and so on through lower members of the geological series of English rocks. Similar conditions

may be found in all other countries, the superposition of strata being widely evident. Each great group of rocks consists of several subdivisions called *formations*, and each group, and even to a considerable extent minor subdivision, is characterized by the presence of distinct assemblages of organic remains. The successive appearance of such remains, which constitutes *the succession of life in time*, was the great discovery of Wm. Smith, made more than a century ago. The main rock-systems into which the earth's crust is divided, and which are based on the characteristics of the organic remains contained in them, are shown in the following table in ascending order:

Life Periods.	Rock Systems.
Post-Tertiary or Quaternary	Recent—Alluvium, Peat, etc. Pleistocene.
Tertiary or Kainozoic	Pliocene. Miocene. Oligocene. Eocene.
Secondary or Mesozoic	Cretaceous. Jurassic: Oolitic. Liassic.
Primary or Palæozoic	Triassic. Permian. Carboniferous. Devonian. Silurian. Cambrian.
Archæan, Laurentian, or Eozoic	Fundamental Gneiss.

Igneus rocks also are associated in different localities with the systems named in the foregoing table.

In the small area of Great Britain a more complete series of rocks exists than in any other part of the earth's surface of equal dimensions—so far as is known. The greater part of the European series is, indeed, nearly complete in England and Wales alone; and since the days of William Smith, the British rocks, from this early and complete study, have generally been the types to which formations in other parts of the world were referred.

Archæan, Pre-Cambrian, or *Laurentian Rocks.*—The *Laurentian* are the oldest known of the sedimentary rocks. They are *metamorphic* (that is, changed from their original structure), and mostly gneissic in character, and were for long classed as granitic and igneous rocks till their true nature was shown by Sir William Logan. They occupy vast tracts of country in Labrador and Canada, consisting there of two divisions, *Lower* and *Upper Laurentian.* The gneiss of the lower division is interstratified with several thick banks of crystalline limestone, in one of which was found a structure believed by Dawson, Carpenter, and others to be a foraminifer and called *Eozoon Canadense.* It is now, however, generally believed to be a mineral product, In the Outer Hebrides and on the west coast of the North Highlands, rocks occur of highly metamorphic gneiss, which are probably of Laurentian age. The term *Pre-Cambrian* or *Archæan* is now applied to these rocks in the British area; they crop out also in North and South Wales, in the Malvern Hills, and in Charnwood Forest in Leicestershire. No fossils have yet been observed in these rocks. The *Huronian Rocks* of North America are possibly intermediate in age between the Laurentian and the rocks next mentioned.

Cambrian.—These rocks come next in succession to the Laurentian strata. The term Cambrian has been used differently by different geologists. The purple grits and slates to which the term Cambrian was restricted by Murchison form the greater part of the group of hills in Wales that lie east of Cardigan Bay: they are also well seen in Carnarvon-

Normal Faults.

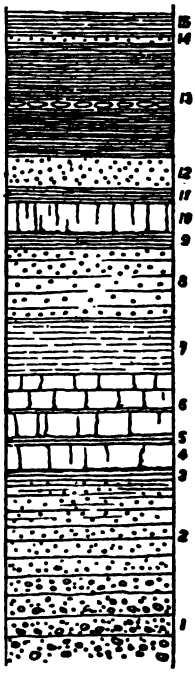
shire, where the celebrated slate quarries of Penrhyn and Llanberis lie in Cambrian strata. Parallel strata, known by the same name, are found abundantly in other parts of the earth. Many of the beds are destitute of fossils, but these occur in certain localities down to the lowest beds of the system, and include brachiopods, trilobites, and other low organisms.

The *Silurian Rocks* were first worked out in detail in South Wales and the bordering counties by Sir Roderick Murchison, and an account of them published in the year 1839 in his *Silurian System.* They are divided by geologists into the *Lower* and *Upper Silurian.* The former comprises in ascending order the *Lingula beds* (so named from a characteristic fossil shell), the *Tremadoc slate,* the *Llandeilo flags,* and the *Caradoc* or *Bala beds.* The Lingula flags (*Potsdam sandstone* of the United States) rest conformably on and in fact pass by gradations into the Cambrian rocks. Above them lie the Llandeilo flags of North Wales, named from the town of Llandeilo in Carmarthenshire, where they

occur in a typical form. Above and passing into these lie the Caradoc or Bala beds (*Trenton limestone* of United States). The most characteristic fossils of the Lower Silurian are the crustaceans known as trilobites, of which more than 200 species are known to belong to these rocks. Other fossils include hydrozoa, corals, echinodermata, numerous mollusca (brachiopods in particular, also lamellibranchiates, pteropods, gasteropods, cephalopods or cuttlefishes). No fishes nor any other vertebrate animals have yet been found in the Lower Silurian rocks. In the United States the Upper Silurian include the *Oriskany* and *Niagara* beds; in Britain occur a number of successive beds, from the *Pentamerus* to the *Ludlow*. All the formations are in general terms fossiliferous, repeating the organisms of the Cambrian, and also having in their upper strata the earliest indications of the fishes, consisting of small teeth and scales of placoid fishes.

Old Red Sandstone and Devonian.—The *Old Red Sandstone* first received that name in contradistinction to the *New Red Sandstone*, the former occurring below and the latter above the Carboniferous strata. Where the uppermost Silurian strata join the Old Red Sandstone there is a gradual passage between them. A broad belt of Old Red Sandstone crosses Scotland in a northeast direction between the Firth of Clyde and Montrose and Stonehaven, and it occurs elsewhere in that country and in various parts of England. The Scotch beds were first carefully studied by Hugh Miller, who discovered in them remarkable fish forms (the Pterichthys, Cephalaspis, etc.). The absence of marine shells and the nature of the fossil fishes of the Old Red Sandstone of Great Britain indicate that the formation was deposited not in the sea, but in a great fresh-water lake, or in a series of lakes, for the nearest living analogues of many of the fish are the Polypterus of the African rivers, the Ceratodus of Australia, and in less degree the Lepidosteus of North America. In Canada, the sandstones of Gaspé are of Devonian age, as is found by their containing Cephalaspis.

The name *Devonian* has been given to a series of rocks in Devonshire bearing fossils intermediate in character between those of the Upper Silurian and those of the Carboniferous limestone, and which are considered as the equivalents of the Old Red Sandstone of the west of England and of Scotland. The terms Devonian and Old Red Sandstone are thus generally considered equivalent in point of time, and, though first found and studied in Britain, are now known in many parts of the world. These rocks have been divided into *Lower*, *Middle*, and *Upper Devonian*. The lower beds chiefly consist of slaty beds and green and purple sandstones, with brachiopods. The middle group, which includes the Plymouth limestone, contains numerous corals. The Upper Devonian group contains land plants (Stigmaria, etc., and many shells), some of which are identical with those found in the Lower Carboniferous limestone-shales.



SECTION SHOWING ALTERNATION OF BEDS.

15. Shale. 14. Seam of sandstone. 13. Shale with septarian nodules. 12. Sandstone. 11. Mudstone. 10. Limestone. 9. Clay. 8. Sandstones. 7. Sandy clays. 6. Limestone with parting of shale. 5. Shale. 4. Limestone. 3. Shale with cement-stone passing down into sandstone (2), which graduates into fine conglomerate (1).

Carboniferous Rocks.—In the south and middle of England, and in Ireland, the *Carboniferous Rocks*, so named on account of the masses of coal contained in them, consist chiefly of limestone at the base and Coal-measures above.

The Coal-measure beds consist of alternations of sandstone, shale, fire-clay or underclay, coal, and ironstone. Underneath each bed of coal is a bed of under-clay with the roots known as Stigmariæ, forming the soil in which the plants were rooted, by the decay of which, passing into peat, material was supplied for the production of coal. These coal-bearing beds are numerous in England, where they have long been worked, their abundant product being the basis of the great industrial progress of that country. In the Carboniferous rocks more than 500

species of fossil plants have been named, a large proportion of which are ferns, including some tree-ferns. The remaining chief plants are gigantic club mosses known as Calamites, Lepidodendron, and Sigillaria. Coniferous trees also occur, as do the wings and wing-cases of beetles and other insects, spiders, etc., and large amphibian land animals. In the purely marine series of rocks, of which the Carboniferous limestone forms the most important part, we find corals, very numerous crinoids, brachiopods also exceedingly numerous, and Lamellibranchiate molluscs. Many cuttlefishes and numerous fish also occur, the latter including great sharks; trilobites are scarce. The greatest known development of the Carboniferous strata is in the United States, in which the beds spread over a vast area of country, and yield an enormous output of coal. They occur also widely in China (though as yet little worked), and to some extent in all the continents and many of the countries of the earth.

PASSAGE OF GRANITE UPWARDS INTO SOIL.
a, solid blocks. *b*, rounded blocks. *c*, soil.

The *Permian* series succeeds the Carboniferous rocks, and were long considered as part of the New Red Sandstone. They were named *Permian* by Sir Roderick Murchison, from the government of Perm, in European Russia, where they largely occur. They consist of sandstone, red marl, etc., and contain a bed of the magnesian limestone. The fossils of the Permian group are generically and specifically few in number, but as a whole their affinities and grouping are decidedly Palæozoic. All the Permian fish have heterocercal tails, like the majority of the Palæozoic genera, in which the vertebral column is prolonged into the upper lobe of the tail, whereas in the modern fishes the vertebral column is not prolonged into either lobe.

The *New Red Sandstone*, or *Trias*, succeeds the Permian strata. It has received the name of *Trias* from the fact that when fully developed, as in Germany, it consists of the three great divisions of *Keuper*, *Muschelkalk*, and *Bunter Sandstein*. Few old genera and no species pass thus far upwards. The majority of the genera of Brachiopoda disappear, and the whole grouping of the fossils now ceases to be Palæozoic, and assumes a character common to the Secondary rocks. In its greatest development in England, the Bunter series (of soft red sandstone and quartz conglomerate) is about 3000 feet thick. The Muschelkalk may be well seen, among other places, near Gotha, and at Eisenach in Thuringia. It is a gray, shelly limestone, rich in fossil mollusca. No fossils are known in the Bunter Sandstones of England, though a few are found in equivalent strata in Europe. The upper red marl (Upper Trias) varies from 500 to 2000 feet in thickness, and contains, besides other fossils, footprints and bones of reptiles. In the United States the Triassic rocks of Virginia and North Carolina contain workable beds of coal. The red sandstone of the Connecticut Valley is of Bunter age. Above the Keuper strata occur a series of beds called the *Rhætic beds*, from similar strata in the Rhætic Alps, and appear to be intermediate between the red marl and the next series of strata. At the bases of the Rhætic beds have been found minute teeth of the earliest known mammal (*Microlestes Rhæticus*), a small insect-eating marsupial.

The *Lias* and *Oolite* series succeed the New Red and Rhætic beds. On the continent of Europe the Lias and Oolite together are termed *Jurassic*, because in a typical form they are largely developed in the range of the Jura. The Lower Lias clay and lime, as a whole, is rich in the remains of life. These include crinoids, decapod crustaceans, Terebratulæ, and other Brachiopoda, and numerous Lamellibranchiate molluscs. Cephalopoda, such as ammonites and belemnites, are specially numerous, together with species of nautilus. Fish are numerous and there appear in the Lower Lias a great number of remarkable reptiles, some of gigantic size, as the Ichthyosaurus, the Plesiosaurus, and the well-known Pterodactyle. The *Marlstone* series, or *Middle Lias*, which is generally a brown, ferruginous, soft, sandy rock, is rich in many forms of ammonite and belemnite, etc. From the *Upper Lias clay* much alum shale, as also the well-known Whitby jet, is obtained. It is a stiff, unfertile, dark-blue clay.

The *Oolitic* strata as a whole stretch across England from southwest to northwest, or from Portland Bill to North Yorkshire. The *Inferior Oolite*, the lowest member of the Lower Oolite, chiefly consists of beds of yellow limestone. Much of the limestone is oolitic, that is to say, it is formed of small concretionary bodies, like the roe of a fish, cemented to-

gether in a calcareous matrix. Among fossils of the Bath or Great Oolite, which succeed that mentioned, are reptiles of the genera Teleosaurus and Megalosaurus, together with the gigantic Cetеosaurus (or whale-lizard), probably about 50 feet in length. During this part of the Oolitic epoch, while in the south of England the strata were exclusively marine, in the middle and north they were to a great extent estuarine, fresh-water, and terrestrial.

The *Middle* and *Upper Oolite* succeed, and are locally divided into many beds, an important section of the *Upper* being the Portland limestone, found especially in the isle of Portland, and used as a favorite building stone. The celebrated Portland stone has been employed in many public buildings, including St. Paul's. Like those of all the other Oolite formations it is cream-colored, and generally fossiliferous. Oolitic rocks, known by the name of *Jurassic*, almost identical with those of Britain, occur largely in France; and the mountain range of the Jura, dividing France and Switzerland, is chiefly formed of Liassic and Oolitic rocks. From thence they range interruptedly northwards and eastwards, covering a large part of the plains of European Russia, and extending along the Himalayas.

As regards the fossil remains of the Lias and Oolite, a remarkable feature is the vast development of Cephalopoda, especially of the genera *Belemnites*, *Nautilus*, *Ammonites*, and *Ancyloceras*. There are also many genera and species of fishes, chiefly in the Lias, and the genera and species of reptiles are so numerous that this life-period has been sometimes called 'the age of reptiles.' The plants include ferns, horsetails, conifers, cycads, etc. Viewed as a whole, the Liassic and Oolitic strata seem to have been deposited in warm seas round groups of islands formed of the older Palæozoic rocks of Europe. Succeeding them is a series of transition strata, known as the *Purbeck* and *Wealden*, developed in several localities and leading upward to the cretaceous rocks.

The *Cretaceous Formation* is divided into a lower and an upper series of strata, comprising in England the *Lower Greensand*, the *Gault*, and the *Upper Greensand*. It derives its name from the *Chalk*, a sort of soft, white limestone, which occurs in thick beds in Europe and Asia, covering an enormous area. On examination with the microscope, much of it is found to consist of the shells of Foraminifera, Diatomacea, spiculæ and other remains of sponges, Polyzoa, and shells, highly comminuted. Somewhat similar deposits are now forming in the open Atlantic at great depths, chiefly of Foraminifera of the genus *Globigerina*. Plants are comparatively few in the Chalk, but animal remains are very numerous. More than eighty species of fish are known; various great reptile forms, as the Mosasaurus, Plesiosaurus, and Ichthyosaurus, Pterodactyles, etc. In America the Cretaceous epoch presents some extraordinary reptilian forms of immense size, also various birds. The sands and marls of New Jersey, are of this age, and similar beds occupy extensive tracts in the western regions; but there is no true white chalk in America.

Of the *Tertiary* strata the *Eocene Rocks* form the lowest division. The strata are divided into the Lower Eocene and the Upper Eocene or *Oligocene*. The Lower Eocene rocks lie sometimes on upper beds of Chalk, and sometimes on beds lower in the series. They are therefore highly *unconformable*, and in this we have the reason of the complete difference in the species of the Cretaceous and Eocene rocks, for great continental areas of Chalk were upheaved above the sea, and remained as dry land for a period of time so long that when they were again submerged the life of Cretaceous times had died out, and other forms appeared. Remains occur of birds allied to the vulture and kingfisher, and a small swimming-bird with tooth-like serratures on the bill; turtles and river tortoises are numerous. In the Upper Eocene or Oligocene various Ungulate mammalia are found, such as the Anoplotherium, Palæotherium, a kind of river-hog, tapirs, etc. In France, in the Paris basin, the Eocene strata are largely developed. The Wahsatch, Bridger and Uinta beds of North America are of Eocene age.

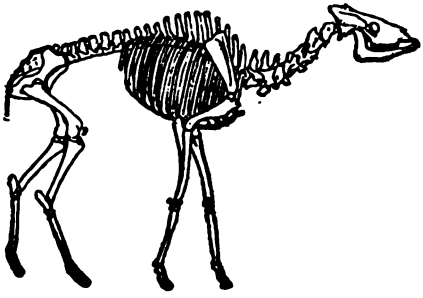
PASSAGE OF SANDSTONE UPWARDS INTO SOIL.
a, solid sandstone.
b, broken-up sandstone.
c, earthy layer.

The *Miocene Rocks* are well represented by strata (mostly of fresh-water origin) in Central France (Auvergne, etc.) and Switzerland. Over many parts of Europe, Asia, and America there are other Miocene strata, each more or less possessing peculiarities. They show a

marked progression in mammalian forms over those of the Eocene, showing a distinct and decided evolution.

The *Pliocene* strata contain many fossils indicative of still greater progress and approaching somewhat closely to the animal forms of modern date. They include remains of species of mastodon, elephant, hippopotamus, and horse, as also of the common otter, deer, etc., of a character showing that the dawn of the recent period is near at hand.

The *Post-tertiary* or *Quaternary* Epoch is that immediately before the period in which we are now (the *recent*). It is characterized especially by various glacial phenomena, and in particular by numerous evidences of a glacial period, when the northern hemisphere was subjected to a climate of the utmost rigor, and much of it buried under beds of glacier ice, probably as thick as that of the north of Greenland at the present day. (See



HELLADOTHERIUM DUVERNOYI.
An extinct member of the giraffe family.

Glaciers.) It is believed that subsequently a slow withdrawal of the glaciers took place, leaving behind them beds of sand, gravel, and clay, full of boulders and ice-scratched stones, intermingled with shells of Arctic or semi-arctic type sometimes lying at heights of from 800 to 1200 and 1400 feet above the present sea-level. These phenomena are more or less universal over great part of Northern Europe and North America. Among Post-tertiary plants there are Scotch firs, pines, yews, oaks, alders. The mammalian remains include those of elephants, rhinoceroses, hippopotamus, the common horse, bison, aurochs, red deer, roe-deer, Irish elk, Machairodus (a tiger?), etc. Many of these animal remains are found in the celebrated *bone caves*, several notable examples of which have been investigated. (See *Cave.*) In these have been found not only such remains as those of the cave bear, cave hyæna, fox, wolf, cat, lion, reindeer, Irish elk, bison, rhinoceros, elephant, etc., but also the works of man, such as flint implements, and in some localities human skulls and other bones associated with the above-named mammalia. When the ice had fully passed away the *recent* period began, distinguished by the presence of man and of the lower animals which still exist, and marked by few and minor geological changes.

Geometrical Mean, the second of the terms of a geometrical progression containing three terms. The geometrical mean of two numbers is equal to the square root of their product. See next article.

Geometrical Progression, a series of numbers which increase or decrease by equal ratios; as, 2, 4, 8, 16, or 16, 8, 4, 2.

Geometry (jē-om'e-tri; Greek *gē*, earth, and *metron*, measure), as its name implies, was primarily the mathematical science which has for its object the measurement of portions of the earth's surface; but now geometry may be termed the science which treats of the properties and relations of definite portions of space, such as surfaces, volumes, angles, lines. The relation between the parts of the same figure may be of two kinds,—of position or of magnitude; for example, two points in a straight line, four points on the same circle, two straight lines perpendicular to one another, a straight line tangent to a circle, are relations of position. On the other hand, the proportionality of homologous lines of two similar figures, the equality of the square constructed on the hypotenuse of a right-angled triangle to the sum of the squares constructed on the sides containing the right angle, that of the volumes of two pyramids on equal bases and of the same height, are relations of dimension. But the relations of position govern the relations of dimension, and *vice versa;* that is, the one set of relations depend upon the other. Thus it is because a triangle is rectangular that the square constructed on one of its sides is equivalent to the sum of the squares constructed on the other two, and, *vice versa*, that relation between the magnitudes of the squares on the three sides depends on the triangle being right-angled. The geometer may draw indifferently from the study of a figure either the knowledge of the relations of position or that of the relations of dimension, on the condition that he knows how to apply relations of the one kind to those of the other: and the principal aim of geometry is to examine into the connection between the

relations of magnitude and those of position.

Geometry may be conveniently divided into several principal sections—elementary geomentry, practical geometry, analytical geometry, infinitesimal geometry, etc. *Elementary geometry* comprehends two parts—plane geometry, the object of which is the study of the simplest figures formed on a plane by straight lines and circles; and solid geometry or geometry of three dimensions, which treats of straight lines and planes considered in any relative position whatever, of figures terminated by planes, of the cylinder, of the cone, and of the sphere. *Analytical geometry*, either plane or solid, makes use of the method of coördinates introduced by Descartes and primarily applied to curves. In ancient times, though curves were studied and the principal properties of conic sections known, still no connection existed between these curves, nor was there any means of establishing one, so that the study of one was of no value to that of another. The first question in introducing the analytical method was then to fix upon some means which should serve to construct every curve by successive points as numerous and as closely brought together as is necessary in order to lay down the curve. Now the position of a point in a plane may be determined by two intersecting perpendiculars drawn from two fixed lines —the coördinate axes—at right angles to each other. An equation may then be found which states the relation between the coördinates of any point, that is, its distance from the two coördinate axes. (See *Coördinates.*) The study of the curves will thus be simply the study of their equations. In this way a typical equation for a curve in a certain system may be got, so that if at another time the curve is represented under another definition in investigating its equation in the same system of coördinates, particularized so as to simplify as much as possible the calculations, it will suffice to compare the particular equation with the general one to verify the identity of the curve, to give it its name, and to know all the properties of it which have been studied previously. In a similar way the analytical geometry of solid bodies is based on the fact that the position of any point in space can be determined by reference to three intersecting planes. *Infinitesimal geometry* is simply a continuation of the analytical geometry of Descartes, of which it may indeed be said it forms a part; the difference consists simply in the nature of the questions which, as they involve the measurement of magnitudes, the incessantly variable elements of which cannot be summed up by finite parts, require the use of the infinitesimal calculus. *Descriptive geometry* consists in the application of geometrical rules to the representation of the figures and the various relations of the forms of bodies according to certain conventional methods. In the descriptive geometry the situation of points in space is represented by their orthographical projections, on two planes at right angles to each other called the *planes of projection.*

History.—The origin of geometry is assigned by an ancient tradition to Egypt, but the history of the science, as far as it is known, commences in Greece with Thales (639-548 B.C.). To him is attributed the discovery of the properties of triangles. His disciple, Pythagoras (born about 580), founded a celebrated school in Italy where geometry was as highly honored as philosophy. He discovered the theorem of the square of the hypotenuse, thus completing, so to speak, the geometry of polygons. He was also the first to show that the circle contains a greater area than any plane figure having the same perimeter, and that the sphere contains the greatest volume bounded by a given surface. After him Anaxagoras, Hippocrates of Chios, Theodorus of Cyrene, and Archytas of Tarentum cultivated the science and have left names connected with various problems, but the next great development of the science is due to Plato and his disciples, who laid the foundation of the analytical method and developed the fundamental principles of geometrical *loci*. Euclid, who belonged to the famous school of Alexandria, and flourished about 285 B.C., has the merit of collecting and systematizing all the more important problems and theorems worked out by his predecessors, besides adding many new ones of his own. He also wrote various other mathematical works, a book of *Data*, a treatise on *Porisms*, etc., most of which have been lost. It is in his *Elements of Geometry*, which are still the favorite text-book, that the method of proof known as the *reductio ad absurdum* is first found. After Euclid came Archimedes (287-212 B.C.). Among his achievements are the determination of the ratio of the diameter of a circle to its circumference, and the investigation of the areas of the circle and parabola and other problems much more difficult than any previously attacked. Archimedes had completed that branch, the object of which is the comparison with each other of magnitudes of the same nature; Apol-

lonius (247 B.C.) made an analogous progress in that which treats specially of the properties of figures. His eight books of *Conics*, in which he considers these curves in the oblique cone, which had not been done until that time, contain almost all their interesting properties, those which relate to their foci, tangents, asymptotes, or diameters, and to their involutes. Eratosthenes, Nicomedes, the inventor of the conchoid; Hipparchus, who made some progress in spherical trigonometry Menelaus (80 A.D.); Ptolemy (125 A.D.), Pappus (390), and Proclus (440), continued the fame of the Alexandrine school. Diophantus introduced methods of an algebraic kind, and was the model on which the Arabic geometers, and Leonard of Pisa, Cardan, and finally Vieta formed themselves. He is thus the connecting link between the ancient and modern geometricians. After the sack of Alexandria and the burning of its library the science was confined to India and to the Arabic school of commentators, and it was not till the middle of the sixteenth century that geometry revived in Europe with Vieta (1540-1603), who introduced the use of algebraic symbols for the solution of geometrical problems. Trigonometry owes to him most of the elegant formulæ which now constitute it. In the writings of Kepler (1571-1631) we find the first applications among the moderns of the method of Exhaustions of Archimedes freed from the difficulties which had encumbered the geometry of the Greeks; and to Cavalieri (d. 1647) belongs the honor of an entirely new method for quadratures and cubatures. Descartes (1586-1650), developed Vieta's discoveries, created the science of analytical geometry, which greatly extended the domain of geometrical science. Fermat (1570-1633) and Barrow (1630-77) with their methods of tangents and of maximums; Huyghens (1629-95), with the theory of involutes, were on the road to the differential calculus, as Roberval, Pascal, and Wallis with their processes of summation were to the integral calculus. Newton (1642-1727) and the brothers Bernouilli (1654-1705. 1667-1748) made important contributions, such as the theorem on the generation of curves of the third order and the method of isoperimeters. About the beginning of the nineteenth century a decided advance was made by Monge (1746-1818) and Carnot (1753-1823). The Descriptive geometry of the former established the whole theory of projections. Carnot's first contribution to geometrical science was his principle of the *correlation of figures*, a principle which, having been farther generalized, is now known as the *principle of continuity*. His second contribution was his *theory of transversals*. On these inventions is founded *modern geometry*, which has revolutionized the science, and has given us generalized conceptions previously undreamed of. Amongst the later geometricians who have contributed to extend the methods and domain of the science we may mention Poncelet for his theory of reciprocal polars, Chasles for his treatise on porisms, etc.; Sir William Rowan Hamilton for his invention of quaternions, an entirely new method; Cayley and Sylvester for their application of generalized geometrical methods to space of more dimensions than three.

Geophagism (jē-of'a-jism), or DIRT-EATING, the practice of eating some kind of earthy matter, clay, chalk, etc., common amongst uncivilized peoples, such as the South American Ottamacs, the Indians of the Hudson Bay country, the West Indian blacks, the negroes in some of the United States of America, and others. In some cases it is probably used to allay hunger, but it is also practised where the supply of food is sufficient. Amongst chlorotic young women a similarly depraved appetite is not uncommon. Uncinariasis (hookworm disease) is sometimes produced by it, the hookworms getting into the blood through the intestines.

George, DUKE OF SAXONY (*the Bearded*), born in 1471; died in 1539; was the son of Albert the Brave, the founder of the Albertine line of Saxony, and succeeded in 1500 to the hereditary dominions of the Albertine house. Later on he became involved in the turmoils of the Reformation period. He was not at first wholly hostile to reform, but thought that it could be better effected by means of papal edicts than by the revolt of Luther. Accordingly he became embittered by the uncompromising tone of Luther's later writings, and endeavored to suppress the Reformation within his dominions by violent measures. These, however, were unsuccessful, and in 1539, on the accession of his brother Henry, who was a Protestant, the Reformation was successfully introduced into the dominions of the Albertine house of Saxony.

George, ST., a saint venerated both in the eastern and western churches, and the patron saint of England. He was canonized in 494 or 496 by Pope Gelasius. His origin is very obscure, one of many legends representing him as a prince of Cappadocia mar-

tyred by Diocletian. Gibbon has sought to identify this legendary saint with the notorious and turbulent Arian heretic George of Cappadocia, who was slain in 361 in a rising of the populace who had been infuriated by his oppression and his violence against pagans and orthodox. But the most eminent scholars, both Roman Catholic and Protestant, are of opinion that the veneration of St. George has been traced up to so early a period as to make it very improbable that a notorious Arian could have been foisted on the Catholic Church as a saint and martyr. The killing of a dragon that was about to swallow a maiden is a legendary feat attributed to him. He was adopted by the Genoese as their patron saint, and in 1222 the Council of Oxford ordered that his day (the 23d of April) should be observed as a national holiday in England; in 1350 he was made the patron of the order of the Garter by Edward III.

George, ORDER OF ST. The following are the principal of the numerous orders which have been founded in honor of St. George:—(1) A military order instituted in Russia in 1769 by the Empress Catharine II as a reward of military achievements. It consists of four classes, to which a fifth, intended for non-commissioned officers and privates, was added in 1807. (2) An order instituted in Bavaria by the Emperor Charles VII (Charles Albert) in 1729, and recognized by King Louis II in 1871. Since the reorganization the order, which had previously been a mere decoration for the nobility, has devoted itself to such services as the care of the wounded on battlefields, etc. (3) An order instituted by Ernest Augustus of Hanover in 1839. (4) A Sicilian military order, instituted by Joseph Napoleon, 24th February, 1808, and remodeled by King Ferdinand IV in 1819. (5) The name under which the order of the Garter was first instituted in England. See *Garter (Order of the)*.

George, ST., one of the Bermudas. It is about 3 miles long and half a mile broad, is fortified, and contains a port of the same name, which is a British military station.

George, THE, a badge exhibiting the figure of St. George encountering the dragon, worn pendent from the collar by the Knights of the Garter. See *Garter*.

George I, of Great Britain, and (GEORGE LOUIS), King Elector of Hanover, was the son of the Elector Ernest Augustus, by Sophia, daughter of Frederick, Elector Palatine, and granddaughter to James I. He was born May 28, 1660, and in 1682 was married to Sophia Dorothea of Zell, whom, in 1694, on account of a suspected intrigue with Count Königsmark, he caused to be imprisoned and kept in confinement for the rest of her life. In 1698 he succeeded his father as elector. He commanded the imperial army in 1707 during the war of the Spanish succession; and ascended the throne of Great Britain on the death of Queen Anne in 1714. Amongst the notable events of his reign were the rising of the Scottish Jacobites (1715-16); the Triple and Quadruple Alliances against Spain (1717 and 1718); and the failure of the South Sea Company (1720). He died in 1727. The private character of George I was bad, but he showed much good sense and prudence in government, especially of his German dominions. By Sophia Dorothea he had a son, George, afterwards George II of England, and a daughter, Sophia, the mother of Frederick the Great.

George II (GEORGE AUGUSTUS), King of Great Britain, son of George I, was born October 30, 1683. He married in 1705 Wilhelmina Carolina of Brandenburg-Anspach. In 1708, then only electoral prince of Hanover, he distinguished himself at Oudenarde under Marlborough. In 1727 he succeeded his father on the English throne, but inherited to the full the predilection of George I for Hanover. His reign is notable for the great events with which it is filled, and for the number of men great in art, letters, war, and diplomacy which then adorned England. The war of the Austrian succession, in which George II himself took part at Dettingen, the Jacobite rebellion of 1745, the conquest of Canada, and the growth of the British empire in India are amongst the chief events of his reign. George II died suddenly October 25, 1760. He was a prince of very moderate abilities, regardless of science or literature; of obstinate temper and vicious habits; but honest and open in his disposition.

George III, GEORGE WILLIAM FREDERICK, King of Great Britain, born in 1738, was the eldest son of Frederick, Prince of Wales, by the Princess Augusta of Saxe-Gotha, and succeeded his grandfather, George II, in 1760. In the following year he married the Princess Charlotte Sophia of Mecklenburg-Strelitz. The sixty years of his reign were filled with great events, amongst which are the Wilkes controversy, the American Revolution, 1775-83; the French Revolution, 1789, and the

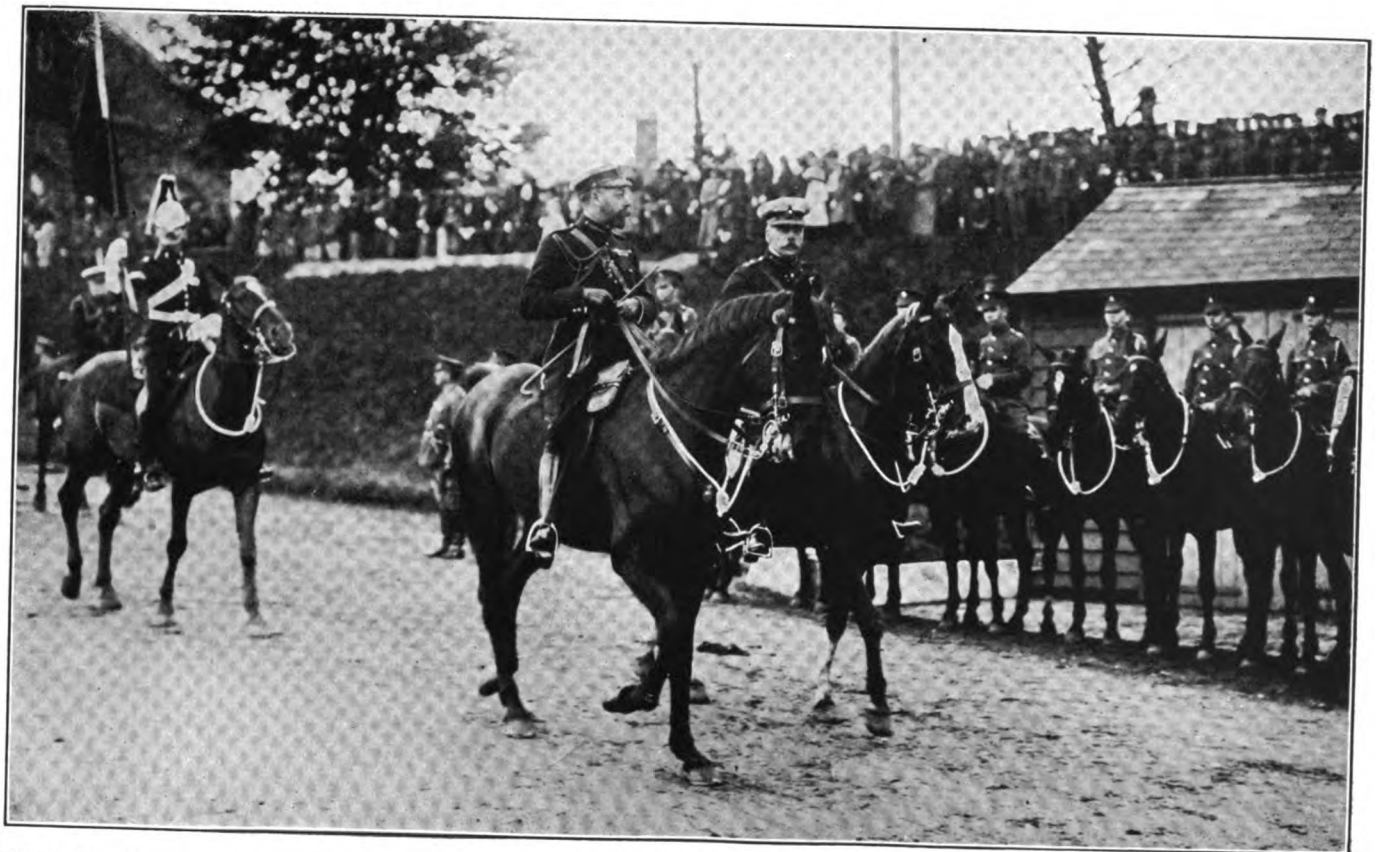


Photo by Paul Thompson.

KING GEORGE AT ALDERSHOT

King George V of England is a splendid equestrian, and, in addition to deriving much pleasure from this exercise, carries himself with

Irish rebellion, 1798, etc. George III, while conscientious, was mentally obtuse, and his narrow patriotism, his obstinate prejudices, and blind partialities were even more hurtful to British interests than the indifference of his predecessors had been. His tastes and amusements were plain and practical, literature and the fine arts receiving but a small share of his attention. His private life was very exemplary. In 1810 the king's mind, which had already given way several times, finally broke down, and from that time to his death on January 29, 1820, his biography is a blank.

George IV (GEORGE FREDERICK AUGUSTUS), King of Great Britain, son of George III and the Princess Charlotte of Mecklenburg-Strelitz, born in 1762; died June 26, 1830. His dissipated life, his extravagance, his supposed marriage with a Catholic, Mrs. Fitzherbert, alienated from him the affection of his father and the esteem of the nation. In 1795 he married the Princess Caroline of Brunswick, from whom he soon separated, and who was afterwards tried for adultery in 1820 and acquitted. In 1811 George became regent, and, on the death of George III in 1820, succeeded as king.

George V (FREDERICK ERNEST ALBERT), King of Great Britain, was born at Marlborough House, London, June 3, 1865. He was the second son of Edward, Prince of Wales, afterwards Edward VII. His elder brother, Duke of Clarence, died in 1892, leaving him heir to the throne, to which he succeeded on the death of his father, King Edward, May 6, 1910. The career of the new king as a prince was largely in the navy, which he entered at the age of 12, and continued until he reached the throne, passing through the several grades from midshipman in 1880 to rear-admiral, 1901, vice-admiral, 1903, and admiral, 1907. This progress in the navy was not made without regard to merit, as the sailor prince showed himself brave, ready and efficient on more than one critical occasion. In 1893 he married the Princess Victoria Mary, daughter of the Duke of Teck, and has six children, the oldest, Edward Albert, succeeding him as Prince of Wales. The sailor prince became Duke of Cornwall when his father took the throne, and soon after started on a tour of the colonies, opening the first parliament of the Commonwealth of Australia in 1901. In the fall of 1905 he went to India, and in 1908 visited Canada, to attend the celebration at Quebec, but did not visit the United States, as his father had done in a similar trip to Canada George V differs from his father in several particulars. He does not share Edward's love of sports, is less approachable and more intellectual, and is devoted to home life. As a monarch, he has shown ability and decision, especially in his determination not to take the coronation oath in its old form of offensive allusion to the doctrines of his Catholic and non-conforming subjects. In 1911 he visited India, a step which no former British king had taken. The purpose of his visit was to be crowned emperor of this distant realm of the empire.

George I, 'King of the Hellenes,' was born at Copenhagen Dec. 24, 1845, second son of the king of Denmark. In 1863 he was elected king by the Greek National Assembly. In 1867 he married the Princess Olga, a niece of the Russian czar. His conduct as a constitutional monarch was correct and regular, and he won the popular sympathies by the efforts he made on behalf of the expansion of Greek nationality. He was fatally shot by an anarchist in Salonika, March 18, 1913, and was succeeded by his son, the crown prince Constantine, born August 2, 1868.

George, HENRY, political economist, was born at Philadelphia, Pennsylvania, in 1839. He wrote a number of works, the most famous being *Progress and Poverty*, upon which was based the doctrine maintained by the 'Single Tax' advocates, namely, that all land should belong to the state and pay a tax sufficient to meet all the expenses of the government. He was the author of several other works. He was twice nominated for mayor of New York, in September, 1886, and October, 1897; in the former he was defeated and he died suddenly during the heat of his canvass of the latter, October 29, 1897.

George, LAKE, a lake in New York state, between Warren and Washington Counties, south of Lake Champlain, into which it discharges at Ticonderoga. It is 36 miles long, and from ¾ mile to 4 miles in width. It is surrounded by lofty hills wooded to the top, has richly wooded shores, and many picturesque islands. Caldwell, Bolton, and other places on its banks are favorite resorts, and in summer large numbers of tourists are attracted by the beauties of its scenery. Here was fought a severe battle in 1755, in which the French and Indians were defeated by the English, and it was the scene of several other warlike events. Fort Ticonderoga lay between it and Lake Champlain.

George Junior Republic, a juvenile

community founded in 1895 near Ithaca, New York, by William R. George, as an experiment in the training of outlaw children of the slums in their future duties as American citizens. The children govern the community themselves under a system of municipal administration, and the experiment has been so successful that similar communities have been founded in other localities.

George-noble, a gold coin of the time of Henry VIII of the value of 6*s.* 8*d.* sterling ($1.60). It is so called from bearing on the reverse the figure of St. George killing the dragon.

George's Channel, St., the arm of the sea which separates Ireland from Wales south of the Irish Sea. From Holyhead and Dublin on the north to St. David's Head and Carnsore Point it extends about 100 miles, with a breadth varying from 50 to 70 miles. Its depth in the middle varies from 40 to 70 fathoms. The bottom is chiefly sand and gravel.

Georgetown (jorj'town), formerly a city of the District of Columbia, on the left bank of the Potomac, near the city of Washington; now a part of Washington, with which it was incorporated in 1878. It is beautifully situated on a range of hills, and abounds with villas and country seats. It contains the Georgetown University (the oldest Catholic college in the United States), the Peabody Library, etc. The Chesapeake and Ohio Canal commences here. Pop. 16,193, included in the District of Columbia.

Georgetown, or Demerara, the capital of British Guiana, at the mouth of the Demerara. It is neatly built, consisting of broad streets at right angles, with canals in the middle, and lofty wooden houses, often with luxuriant gardens attached. There is a bar at the mouth of the river, and large ships have to discharge and load by means of lighters. Georgetown is the seat of an Anglican bishop, and has a number of churches, schools, hospitals, etc. The chief exports are sugar, rum, and coffee. Pop. 53,176, of whom only one-tenth are whites.

Georgetown, county seat of Georgetown County, South Carolina, a port of entry at the head of Winyah Bay on Sampit River, 50 miles N. E. of Charleston. It has turpentine distilleries, saw mills, and other industries, and a trade in cotton, naval stores, lumber, fish, etc. Pop. 5530.

Georgetown University, an educational institution in Washington, D. C., founded in 1789 under the auspices of the Roman Catholic Church. It has about 850 students attending and 144 instructors in the faculty, and a library of over 100,000 volumes.

Georgia (jorj'i-a; by the Russians called *Grusia*, and by the natives themselves *Karthli*, was formerly a kingdom, but is now included in the Russian government of Tiflis, though the name is sometimes loosely employed to designate a much larger portion of the territory possessed by Russia south of the Caucasus. In the latter sense it has an area of say 34,000 square miles, but Georgia proper does not exceed about 15,000 square miles. The natives are a fine-looking race, the Georgian women, like the Circassians, being celebrated for their beauty. The Georgian language, together with that of the Mingrelians, Lazes, and other Caucasian peoples, seems, according to the latest researches, to form a perfectly distinct linguistic family. It possesses a not unimportant literature, commencing with the introduction of Christianity into the country. The history of the Georgians first becomes trustworthy about the time of Alexander the Great, to whom they became subject. About B.C. 324 they gained their independence under Pharnavas. They became Christianized towards the end of the fourth century. After yielding for a time to the supremacy of the Arabian caliphs Georgia regained its independence towards the end of the tenth century, which it retained till 1799, when Heraclius, successor of George XI, formally ceded his dominions to the Russian emperor Paul.

Georgia, one of the Southern United States, is bounded N. by Tennessee and North Carolina, E. by South Carolina and the Atlantic, S. by Florida, and W. by Alabama; length, north to south, 320 miles; breadth, 255 miles; area, 59,265 sq. miles (about the same as England and Wales). The coast is bordered by a chain of islands, separated from the mainland by narrow lagoons or sounds. On them the famous sea-island cotton is raised. The land is low towards the coast, beginning as a salt marsh, grown over with tall reeds, continuing next as swampy rice plantations and then as 'pine barrens' about 60 to 90 miles inland, whence it gradually rises as a sandy district, interspersed with fertile tracts, till it reaches the lower falls of the Savannah, Ogechee, Oconee, and other rivers. Here the hilly and finally mountainous region called the Upper Country begins, a fertile and salu-

GEORGIA
Scale of Miles
0 10 20 30 40 50 60
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
ALABAMA
FLORIDA
ATLANTIC OCEAN
Atlanta
Augusta
Savannah
Brunswick
Macon
Columbus
Americus
Thomasville
Waycross
Athens
Cartersville
Dalton
Griffin
Albany
Tallahassee
Jacksonville
Longitude West from Greenwich

brious region extending north and west till it rises into the Appalachian mountain chain, the highest peak in the state being 4821 feet. Along the coast and near the lower courses of the streams are rich alluvial districts, interspersed with meadows, which are suited to rice culture. In the southwestern part of the State is a large area which has long been justly celebrated for its cotton product, Georgia being next to Texas in its yield of cotton, averaging about 2,000,000 bales annually. Of the rivers, the Chattahoochee, which flows under the name of the Appalachicola into the Gulf of Mexico, is navigable for steamers for 300 miles; the Savannah is navigable for steamers part of the year for 250 miles; and the Altamaha and its affluents are navigable for small vessels 300 miles upwards. The climate is mild and pleasant, but unwholesome in the low parts of the country during the months of July, August, and September. The soil in many parts is very rich. Cotton and corn are the leading plantation products, and rice, with some sugar-cane, are staple crops in the lowlands. In addition, tobacco, the sweet potato, and other crops are cultivated with success. The fruits, which include peaches, apples, melons, oranges, bananas, etc., are of the finest and large quantities of them are shipped to the North. The chief minerals are granite, marble, iron ore, limestone, clay, asbestos, manganese, bauxite, some coal, gold, silver, lead, etc. Georgia ranks second (Vermont, first) in the production of granite in the United States. The pine forests furnish large supplies of lumber, rosin and turpentine. Of manufactures, the most important is the production of cotton goods, and of cotton-seed oil. Atlanta is the seat of the legislature and largest town; the other principal towns are Savannah (the chief seaport), Augusta, Macon, and Columbus.

A charter for the foundation of a colony in the territory now called Georgia was obtained in 1732 by General Oglethorpe from George II, after whom the state was named, his purpose being to colonize it with debtors taken from the London prisons. Georgia was one of the thirteen original states. In 1788 it adopted the constitution of the United States by a unanimous vote. In January, 1861, Georgia seceded with the Confederates, took an active part in the Civil war, and was conquered by a Federal army under General Sherman (1864-5) and restored to the Union. The history of Georgia in the last few years has been one of material progress. The National Expositions held at Atlanta in 1881 and 1895 were of great benefit to agricultural and manufacturing interests, which have rapidly developed. Pop. 2,609,121.

Georgia, Gulf of, a large gulf of the North Pacific Ocean, between the continent of North America and Vancouver's Island; about 120 miles in length from north to south; the breadth varies greatly in its different parts, from 6 miles to 20. It communicates with the ocean on the north by Queen Charlotte Sound, and on the south by the Strait of Juan de Fuca.

Georgia, South, an island in the South Atlantic, lat. at its north point 53° 57′ s.; lon. 38° 13′ w. It is 90 miles long, and has high and rocky coasts, inaccessible from ice during a great part of the year. It abounds with seals and sea-fowls.

Georgia Bark (*Pinckneya pubens*), a small tree of the Southern United States closely resembling the cinchona or Peruvian bark, and belonging to the natural order Cinchonaceæ. The corolla is tubular; the stamens five, with a single style; and the capsule contains two cells and numerous seeds. The wood is soft and unfit for use in the arts. The inner bark is extremely bitter, and is employed with success in intermittent fevers.

Georgian Bay, formerly called Lake Manitoulin, the northeastern part of Lake Huron, partly separated from the main body of the lake by the peninsula of Cabot's Head and the island of Great Manitoulin. It is about 120 miles long and 50 broad.

Georgievsk (gä-or'gē-efsk), a garrison town in the province of Terek, North Caucasia, Russia. It has a trade in silk and leather. Pop. 14,000.

Georgium Sidus, the name given by Herschel to the planet which he discovered March 13, 1781; now known as Uranus.

Georgswalde (gē-orgs-väl'dă), a town in Bohemia, Austria, on the Saxony frontier. It has linen manufacturers. Pop. (1910) 8836.

Geotropism (jē-ot'ru-pizm), in botany, a disposition or tendency to turn or incline towards the earth, as the characteristic commonly exhibited in a young plant, when deprived of the counteracting influence of light, of directing its growth towards the earth.

Geotrupidæ (jē-o-trū'pi-dē), a family of burrowing lamellicorn beetles. They inhabit temperate climates, and are useful in removing disgusting substances. When alarmed they feign death. The *Geotrupes ster-*

corarius, or watchman-beetle of Britain, is the type of the family.

Gepidæ (jēp'i-dē) a people of Germanic origin, first read of as settled about the mouth of the Vistula in the third century. Before the fifth century they had migrated to the Lower Danube, where they were subjugated by the Huns; but, revolting against Attila's son, they recovered their freedom and established themselves in Dacia. There their power grew so great that they levied tribute from the Byzantine emperors down to Justinian's days. In the end of the fifth century a powerful enemy arose against them in the Ostrogoths; and after them came the Longobards, who, in alliance with the Avars, inflicted a crushing defeat on the Gepidæ in 566. A part submitted to the Avars, while a part accompanied the Longobards to Italy, and finally became assimilated.

Gera (gā'râ), the chief town of the principality of Reuss-Schleiz, in Germany, on the right bank of the Elster, 35 miles S. S. W. of Leipzig. It has manufactures of woolen, linen, cotton, and other goods. Pop. 47,455.

Gerace (je-rä'chā), a town of S. Italy, province of Reggio di Calabria, 36 miles N. E. of Reggio. The cathedral, once a handsome structure, was ruined by the earthquake of 1783. Pop. 10,752.

Gerando. See *De Gerando.*

Geraniaceæ (je-ra-ni-ā'se-ē), a nat. order of exogenous plants, the distinguishing character of which is to have a fruit composed of five capsules or cases, connected with as many flat styles, consolidated round a long, conical beak, giving some of the species the name of stork's-bill and crane's-bill. These plants are usually astringent and odoriferous, and many of them have beautiful flowers, especially those of the genus *Pelargonium*, natives of the Cape of Good Hope. The species are mostly herbaceous plants. A few of them have edible tubers. See next article.

Geranium (je-rā'ni-um), the typical genus of the order Geraniaceæ (which see), popular name crane's-bill. They have usually palmately divided leaves and regular flowers with ten stamens and five carpels. Some thirteen species are wild in Europe, of which the *G. robertianum* or herb-robert is the most common. An American species, *G. maculātum*, from its astringency called 'alum-root,' is used medicinally as a gargle and otherwise. The so-called geraniums of our gardens belong to the genus *Pelargonium*. Cultivation has produced many varieties, which from their beauty are great favorites.

Gérard (zhā-rär), FRANÇOIS PASCAL, BARON, a French historical and portrait painter, born at Rome in 1770; went to Paris (1786), and studied under David. In 1795 he exhibited his first notable painting, *Belisarius*. He was much patronized by Napoleon, for whom he painted the battle of Austerlitz, and was made a baron by Louis XVIII, after completing his large painting of the *Entrance of Henry IV into Paris*. Amongst his portraits the most famous are those of Talleyrand, Talma, Louis Philippe, Madame Récamier, Mlle. Mars, etc. He died in 1837.

Gérard, JEAN IGNACE ISIDORE, a French caricaturist and book illustrator, generally known under the pseudonym of Grandville, was born at Nancy in 1803, died at Paris in 1847. He went to Paris in 1824, and after some minor works acquired great popularity in 1828 by his *Metamorphoses du Jour*, a representation under the guise of animal heads of human foibles and weaknesses. Later on he became a contributor to *Le Charivari* and an illustrator of the works of Béranger, La Fontaine, *Gulliver's Travels*, *Robinson Crusoe*, etc.

Gérard, MAURICE ETIENNE, COUNT, marshal and peer of France, born 1773. He served as a soldier during the republic and the empire, distinguishing himself at Austerlitz and other battles. In 1813 he was made a general of division and a count. He distinguished himself in the battle of Ligny, and at Waterloo acted under Grouchy. He took an active part in the revolution of 1830; became war minister and marshal; commanded the troops which reduced Antwerp in 1832; became prime minister 1834; commander of the national guard 1838; died at Paris in 1852.

Gérard de Nerval, the pseudonym of Gérard Labrunie, a French man of letters, born in Paris in 1808. His earlier productions were poetic, *Elégies nationales* and *Poésies diverses*. As an adherent of the Romantic school he set himself to translate Goethe's *Faust*, and performed it in a manner which the old poet himself pronounced a marvel of style. Amongst his best works are his short tales and sketches, *Voyages en Orient*, *Contes et Facéties*, *La Bohème Galante*, etc. He became insane and committed suicide in Paris, 1855.

Gerasa (je-rä'sâ), GERASH, or DJERASH, a ruined town in Syria, 80 miles S. S. W. of the town of Damascus. It was several times de-

stroyed and rebuilt. The ruins, comprising ancient walls, gateways, a forum, baths, theaters, and temples, are very extensive.

Gerba, or JERBA (jĕr'ba), an island in the Gulf of Cabes, off the coast of Tunis. It is about 20 miles long and 14 broad. The surface is level and fertile, and occupied by a population of 45,000, mostly Berbers.

Gerbillus (jer-bil'us), a genus of small burrowing rodents (the gerbils) of the family Muridæ (mice). They have a long tail, which is tufted at the end. There are several species, found in the sandy parts of Africa and Asia. The Egyptian gerbil (*G. Ægyptiacus*), which inhabits Egypt around the pyramids, is the type. It is about the size of a mouse and of a clear yellow color.

Gerfalcon (jer'faw-kn). See *Falcon.*

Gerhard (ger'hârt), EDUARD, a German archæologist, born in 1795; died in 1867. Having traveled in Italy, he devoted himself to archæology, and in 1829 took part in founding the Archæological Institute at Rome. Returning to Germany in 1837, he became archæologist at the Royal Museum at Berlin, and afterwards professor at the university. Among his numerous works are the following: *Antike Bildwerke* (with 140 plates); *Auserlesene Griechische Vasenbilder* (330 plates); *Etruskische und Campanische Vasenbilder, Griechische Mythologie,* etc.

Gerhardt, KARL, an American sculptor, born at Boston in 1853. His works of sculpture include busts of General Grant, Henry Ward Beecher and Samuel L. Clemens and statues of John Fitch, Nathan Hale, Israel Putnam and many others.

Gerhardt (ger'hârt), KARL FRIEDRICH, a German chemist, born in 1816. He studied under Liebig at Giessen, went to Paris in 1838, was appointed professor of chemistry at Montpellier, returned to Paris in 1842 to pursue his investigations; went in 1855 to Strasburg as professor in chemistry and pharmacy, but died soon after, in 1856. Gerhardt is the author of several works, amongst which the most celebrated is his valuable *Traité de Chimie Organique.* The methods he originated have had a great influence on modern chemistry.

Gerhardt, PAUL, the greatest of German hymn-writers, born in 1607. He studied theology, became pastor of Mittenwalde in 1651, and afterwards at Berlin. A strict Lutheran, he opposed energetically all attempts to unite the Lutheran and Reformed Churches, and was removed from his church in 1666 in consequence of his refusal to subscribe to the edict of 16th Sept., 1664, prohibiting mutual insults or offensive language between the churches. In 1668 he was made archdeacon in Lübben, where he died in 1676. His excellent book of hymns appeared at Berlin in 1667 (*Geistliche Andachten*). Many particular hymns have found English translators and appreciation.

Gericault (zhā-rē-kō), JEAN LOUIS THÉODORE ANDRÉ, a French painter, born at Rouen in 1791; went to Paris in 1806 and studied under Charles Vernet and Guérin. His first pictures (the *Chasseur Officer* and the *Wounded Cuirassier*) were exhibited in 1812 and 1814. In 1817 he visited Italy, returned to Paris in 1819, and painted the *Raft of the Medusa* (a well-known shipwreck of the time), a work of much power, which won immediate popularity. He died at Paris in 1824.

Gerizim (jĕr-i'zim), MOUNT. See *Ebal.*

Germ (jĕrm), in physiology, the earliest form under which any organism appears; that is, the rudimentary or embryonic form of an organism. The name is also given to certain minute organisms which give rise to disease. See *Germ Theory.*

Germain (zher-maṇ), ST., the name of a number of places in France, among which is St. Germain-en-Laye, a town in the department of Seine-et-Oise, about 6 miles north from Versailles and 11 miles W. N. W. from Paris, on the left bank of the Seine. The most remarkable building is the royal palace, commenced by Charles V in 1370, and embellished by several of his successors, especially Francis I and Louis XIV. It was used as a prison during the revolution, afterwards as a high school for calvary officers, and was ultimately restored in 1862 by Napoleon III, who established in it a museum of Gallo-Roman antiquities. The forest of St. Germain is one of the finest in France, extending over 10,000 acres. Pop. 17,297.

German Catholics, a religious sect which sprung up in Germany about the close of the year 1844. The immediate cause of its formation was the exhibition by Arnoldi, bishop of Trèves, of the holy coat preserved in the cathedral of that city, accompanied by a promise of plenary indulgence to whoever should make a pilgrimage to Trèves to worship it. The announcement caused a general feeling of astonishment in Germany, and two

priests, Johannes Ronge of Silesia and Johann Czerski of Posen, whose independent views had already caused the deposition of the one and the secession of the other, led a secession movement, appealing to the lower grades of clergy to unite in founding a national German church independent of the pope. A number of congregations were formed, especially in Leipzig, under the celebrated Robert Blum, and in Magdeburg, under the teacher Kote. Two creeds were drawn up for the new church, the *Confession of Schneidemühl*, by Czerski, which, though somewhat Roman Catholic, rejected indulgences, purgatory, auricular confession, etc., and the *Confession of Breslau*, drawn up by Ronge. The latter, which was far more heterodox, was substantially adopted by the Council which met at Leipzig, March 22, 1845. The organization was almost the same as that of the Presbyterian Dissenting churches of Scotland. Each congregation was to choose its own pastor and elders. For a time the new church had a great success. Many Protestants joined the body, which, by the end of 1845, numbered nearly 300 congregations. Difficulties soon arose, however. The majority of the German governments began to use repressive measures. More fatal were internal dissensions, one party, headed by Czerski, clinging to the traditions and doctrines of the Roman Catholic Church, the other, headed by Ronge, tending to mix up democratic and socialistic principles with their creed. After the rise of 'Old Catholicism' the movement lost all importance.

German Confederation. See *Germany*.

German Evangelical Protestant Church (United States) is liberal in doctrinal belief, having no confession of faith. Its ministers are associated in district unions. It has a membership of about 35,000.

German Evangelical Synod of North America. This body accepts the symbolical books of the Lutheran and Reformed Churches, representing in the United States the State Church of Prussia, which is a union of the Lutheran and Reformed bodies. It celebrated, Oct. 12, 1890, the semicentennial anniversary of its organization in the United States. The number of members is about 300,000.

Germanicus (jer-man'i-kus), CÆSAR, a distinguished Roman, son of Nero Claudius Drusus and the younger Antonia, a niece of Augustus, was born B.C. 15. He was adopted by Tiberius, his parental uncle, and married Agrippina, the granddaughter of Augustus. When Augustus died (in A.D. 14) Germanicus was invited by the rebellious legions on the Rhine to assume the sovereignty, but refused, and quelled the revolt. He then crossed the Rhine, surprised and defeated the Marsi with great slaughter. Next year (A.D. 15), a campaign against the Catti and the Germans, led by Arminius, resulted in a series of victories. The following year he again made his way into Germany, defeated the Cherusci twice, and made an incursion into the country of the Marsi. Tiberius now became jealous of the glory of Germanicus, called him home under pretense of granting him a triumph, then, to get rid of him, sent him into the East to compose the disturbances in Armenia and Cappadocia. This he performed in A.D. 18, visited Egypt the following year and died on his return to Syria (A.D. 19) under some suspicion of having been poisoned by Cn. Piso, the governor of Syria.

Germanium (jer-man'i-um), a metallic element discovered by Dr. Winckler in 1885. Its symbol is Ge; atomic weight 72.3; has a melting point of about 1650° F., a perfect metallic luster and a grayish-white color. Fifteen years before its discovery its existence had been prophesied by Mendelejeff to fill a gap in his periodic table between silicon and tin.

German Ocean. See *North Sea*.

German Paste, the name given to a kind of paste made for feeding cage-birds, such as canaries, larks, nightingales, etc. The following is one of various recipes: one pound of pea-meal, half a pound of blanched sweet almonds, two ounces of fresh butter, two ounces of moist sugar, fifteen grains of hay saffron. Mix and beat well with a little water, pass through a colander, then expose to the air till dry.

German Sarsaparilla, a name given to the roots or rhizomes of *Carex arenaria*, *C. disticha*, and *C. hirta*, from their being occasionally used in Germany as a substitute for sarsaparilla.

German Silver, NICKEL SILVER, or PACKFONG, is an alloy of copper, nickel, and zinc in different proportions, amongst which the following may be mentioned. Spoons and forks are made from 2 parts copper, 1 nickel, 1 zinc; knife and fork handles from 5 copper, 2

GERMANY
WESTERN SECTION
SCALE OF MILES
DENMARK
SCHLESWIG
HOLSTEIN
Kiel
Hamburg
OLDENBURG
BREMEN
HANOVER
Hanover
Brunswick
PROVINCE
Magdeburg
SAXONY
Halle
Leipzig
Chemnitz
Dresden
Berlin
WESTPHALIA
Dortmund
Essen
Cologne
Aachen
RHENISH
PRUSSIA
NASSAU
HESSE
Cassel
Frankfort
THURINGIA
Mainz
Wiesbaden
Coblenz
Mannheim
Ludwigshafen
PALATINATE
(TO BAVARIA)
LORRAINE
Strasburg
Stuttgart
WURTTEMBERG
BAVARIA
Nuremberg
Munich
Augsburg
Regensburg
Passau
Furth
Bamberg
Wurzburg
Karlsruhe
Freiburg
Constance
SWITZERLAND
BELGIUM
NETHERLANDS
Rhine R.
Elbe R.
Danube R.
Baltic Sea
North Sea
Helgoland
Heligoland
For explanation of numbers in Thuringia, D 3, see Map of Germany, East
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B Longitude East 8° from Greenwich C

nickel, 2 zinc, a mixture closely resembling alloyed silver; addition of lead produces an alloy which appears well fitted for casts, and for making candlesticks, etc.; iron or steel, on the other hand, makes the alloy whiter, harder, and more brittle. German silver is harder than true silver, and takes a splendid, high polish. It melts at a red heat, the zinc being volatilized in the open air. It is attacked by the strong acids, and it is also affected by common organic acids, such as vinegar, and by some saline solutions.

German Tinder, or AMADOU, is prepared from the *Bolētus fomentarius*, a fungus growing on the oak, birch, and some other trees, or from the *Bolētus igniarius* found on the willow, cherry, plum, and other trees. The fungus is removed with a sharp knife, washed, boiled in a strong solution of saltpeter, beaten with a mallet, and dried. In surgery it is sometimes used to stop local bleeding.

Germantown (jer'man-toun), a northern section of Philadelphia, pleasantly situated on high ground, about 6 miles north of the city hall. It was settled by Germans about 1683 immediately after the founding of Philadelphia, and here Washington attacked the British occupying Philadelphia, October 4, 1777, but was defeated. It is largely settled by business men of the city and contains many elegant residences.

Germany (jer'ma-ni; Latin, *Germania;* German, *Deutschland;* French, *Allemagne*), the name given collectively to the states in Central Europe which constitute the German Empire. The limits of Germany have varied greatly at different times; and at present there are large numbers of Germans in race and language who are not included within the boundaries of the empire, many being natives of Austria and Switzerland. On the other hand, the political boundaries of Germany contain several millions of Slavs, Lithuanians, Poles, etc. As one of the Teutonic peoples, the Germans are akin by race to the Dutch, English, and Scandinavian peoples. The capital of Germany is Berlin; other large towns are Hamburg, Breslau, Munich, Dresden, Leipzig, Cologne. As each state is described under its own name, the description given below is confined to leading features which belong to Germany as a whole. The population by the census taken in the year 1910 was 66,715,000. The following table shows the component parts of the empire in 1905:

KINGDOMS.	Area in sq. miles.	Population.
1. Prussia	134,463	37,293,324
2. Bavaria	29,282	6,524,273
3. Würtemberg	7,528	2,302,179
4. Saxony	5,787	4,508,601
IMPERIAL TERRITORY.		
5. Alsace-Lorraine	5,668	1,814,564
GRAND-DUCHIES.		
6. Baden	5,821	2,010,728
7. Hesse	2,965	1,209,175
8. Mecklenburg-Schwerin	5,135	625,145
9. Mecklenburg-Strelitz	1,131	103,451
10. Oldenburg	2,479	438,856
11. Saxe-Weimar	1,388	388,095
DUCHIES.		
12. Brunswick	1,424	485,958
13. Saxe-Meiningen	953	268,916
14. Saxe-Coburg and Gotha	755	242,432
15. Saxe-Altenburg	511	206,508
16. Anhalt	906	328,029
PRINCIPALITIES.		
17. Waldeck	433	59,127
18. Lippe	469	143,577
19. Schaumburg-Lippe	131	44,992
20. Schwarzburg-Rudolstadt	363	96,825
21. Schwarzburg-Sondershausen	333	85,152
22. Reuss (elder line)	122	70,603
23. Reuss (younger line)	319	144,584
FORMER FREE TOWNS.		
24. Bremen	99	263,440
25. Hamburg	158	874,878
26. Lübeck	115	105,857
	208,738	60,641,278

Physical Features.—Germany, as regards its surface, may be divided into three different regions. Farthest south is the Alpine region along the southern frontier, comprising parts of Bavaria, Würtemberg, and Baden lying next to Austria and Switzerland. North of this the Suabian-Bavarian plateau extends to the mountain region of Central Germany, where the chain known as the Fichtelgebirge is continued east by the Erzgebirge and the Riesengebirge, forming the boundary next Austria; west by the Thüringerwald, Rhöngebirge, and Spessart; farther north lie the Harz Mountains. The great plain in the north extends without interruption to the German Ocean and the Baltic. Germany is remarkably well watered. Its central mountain region and plateau form part of the great watershed of Europe. The Danube proceeds across it in an eastern direction, and the Rhine, though it neither rises nor terminates within Ger-

many, flows within it for the greater part of its course. After these come the Elbe, the Oder, Weser, Main, Neckar, Mosel, Ems, and Eider—all of which are navigable. Germany possesses much and varied mineral riches, the most important minerals being bituminous and brown coal, iron, zinc, lead, and salt. Tin, quicksilver, antimony, sulphur, marble, kaolin, asbestos, freestone, etc., occur in various localities. Germany is likewise extremely rich in mineral waters, especially in the southern parts. Though the country extends over 8½° of latitude, its mean annual temperature is remarkably uniform. This is owing mainly to the different elevations of the surface, the low plains of the north having a higher, while the hills and plateaux of the south have a lower temperature than their latitudes might seem to indicate. The mildest climate is enjoyed by the valleys of the Rhine and the Main.

Agricultural Products, Etc.—These are varied and numerous. With the exception of the loftier mountain districts, where the surface is fit only for pasture, the growth of all the ordinary cereals is universal. Potatoes, hemp, and flax also form most important crops, and in many parts the sugar-beet is cultivated on an extensive scale; also tobacco and hops. Wine is produced in many districts. The cultivation of the vine diminishes in importance from southwest to northeast, but is carried on to some extent even in the Prussian provinces of Saxony, Brandenburg, and Posen. Great quantities of other fruits are produced, principally the apple, pear, plum, and cherry. The forests are of great extent and value, particularly in the mountain districts. The central plateau is more sparingly wooded, but the eastern part of the north plain has extensive forests. This plain is largely sandy, but has been made to yield abundantly and furnishes grazing grounds for large numbers of farm animals. Among domestic animals, the horned cattle of the districts along the North Sea and the Baltic, the sheep of Saxony and Silesia, and the swine of Westphalia have long been famous. The horse, except in Schleswig-Holstein, East Prussia, Mecklenburg, and some other parts, appears to be much neglected. Game is very abundant, and includes, in addition to the smaller kinds, the boar and the wolf. Fish are numerous, both in the rivers and lakes.

Manufactures.—Linens are made in every part of Germany, but more especially in Westphalia, Silesia, Bohemia, and Saxony; woolens in the Prussian provinces of the Rhine, Saxony, Brandenburg, and Silesia, in the kingdom of Saxony, and in Alsace; the cotton manufacture constitutes the chief manufacturing industry in Alsace-Lorraine, the kingdoms of Saxony and Würtemberg, and the grand-duchy of Baden, and flourishes in Bavaria, Prussia, and other parts; the silk manufacture flourishes in the Rhine provinces and in Baden; iron manufactures are carried on in most of the states, but principally in Prussia, Alsace-Lorraine, Bavaria, and Saxony; steel is largely manufactured in the Rhine provinces. The manufactures of beet-root sugar, of leather, of metals, porcelain, glass, fancy flowers, hats, musical instruments, watches, clocks, wooden wares, including toys, etc., are likewise important: and breweries and distilleries are to be met with everywhere, beer being the favorite beverage of the Germans. Stettin is one of the principal shipbuilding centers in the world and the Krupp ironworks at Essen are unrivaled.

Commerce.—The commerce is very extensive, and is administered and guided by special laws of a union called the Zollverein or Customs Union, which embraces the whole of Germany and also the grand-duchy of Luxemburg. The exports and imports comprise a great variety of manufactured goods and raw products. The manufactures of Germany are now sent to all parts of the world, and in various places there is a strong competition between German and British goods. By far the principal seaport is Hamburg; others are Bremen and Bremerhaven, Stettin, Königsberg, Dantzig, Lübeck, etc. The total length of railways is over 37,000 English miles, of which all but about one-twelfth are state railways. By the law of Dec. 4, 1871, a uniform gold standard was introduced for the monetary system of the whole German Empire. The denominational unit is the *mark*, nearly equal to 1*s.* of British money and divided into a hundred *pfennige*. Since 1872 the French metrical system of weights and measures has been in force throughout the German Empire. See *Decimal System*.

Finances.—The revenue is derived principally from the customs duties collected throughout the Zollverein, from excise duties on beet-root sugar, salt, tobacco, and malt, and from the contributions made by each state in proportion to its population. According to the budget for year ending March 31, 1911, the revenue amounted to 2,853,781,095 marks, of which customs and excise were estimated to yield 1,441,620,000 marks. The chief item in the expenditure was on military administration, amounting to 806,740,757

BALTIC SEA
Gulf of Danzig
Konigsberg
EAST PRUSSIA
WEST PRUSSIA
POMERANIA
Pomeranian Bay
Stettin
MECKLENBURG STRELITZ
BRANDENBURG
BERLIN
Frankfurt
POSEN
SILESIA
Breslau
SAXONY
Dresden
Leipzig
Gorlitz
Lusatia
POLAND
RUSSIA
Warsaw
Lodz
Posen
Danzig
Elbing
Marienburg
Thorn
Bromberg
Graudenz
Culm
Plock
Vistula R.
Warta R.
Oder R.
Neisse R.
Elbe R.
Saale R.
Spree R.
Havel R.
Warthe R.
Netze R.
Brahe R.
Drewenz R.
Ossa R.
Pregel R.
Memel R.
Niemen R.
Vistula R.
Bug R.
Narew R.
Bobr R.
Pripet Marshes
Prague
AUSTRIA-HUNGARY
BOHEMIA
MORAVIA
Krakow
Beuthen
Gleiwitz
Kattowitz
Konigshutte
Lublinitz
Czenstochowa
Kalisz
Posen
Stettin
Kolberg
Stolpmunde
Rugenwalde
Swinemunde
Usedom
Wollin
Rugen I.
Hela
Pillau
Memel
Tilsit
Insterburg
Gumbinnen
Allenstein
Osterode
Ortelsburg
Neidenburg
Soldau
Illowo
Strasburg
Deutsch Eylau
Preussisch Eylau
Braunsberg
Heiligenbeil
Mehlsack
Hollsberg
Elbing
Pr. Holland
Marienburg
Dirschau
Stargard
Konitz
Schlochau
Flatow
Krone
Deutsch Krone
Schneidemuhl
Dramburg
Neustettin
Greifenberg
Cammin
Greifswald
Stralsund
Barth
Ribnitz
Rostock
Wismar
Lubeck
Hamburg
Altona
Kiel
Flensburg
Schleswig
Jutland
Fehmarn
Rugen
Usedom
Wollin
Oder Haff
Stettiner Haff
Frische Haff
Kurische Haff
Putziger Wiek
Danziger Haff
Weichselmunde
Neufahrwasser
Putzig
Leba
Lauenburg
Neustadt
Schwetz
Graudenz
Culm
Briesen
Strasburg
Soldau
Illowo
Ortelsburg
Johannisburg
Lyck
Lotzen
Oletzko
Rastenburg
Angerburg
Goldap
Pillkallen
Tilsit
Memel
Kranz
Palmnicken
Bruster Ort
Pillau
Gulf of Danzig
Frische Nehrung
Weichselmunde
Neufahrwasser
Danzig
Elbing
Marienburg
Pr. Holland
Braunsberg
Preussisch Eylau
Deutsch Eylau
Mehlsack
Hollsberg
Allenstein
Osterode
Ortelsburg
Neidenburg
Soldau
Illowo
Strasburg
Graudenz
Culm
Thorn
Bromberg
Konitz
Schlochau
Flatow
Krone
Deutsch Krone
Schneidemuhl
Dramburg
Neustettin
Greifenberg
Cammin
Kolberg
Koslin
Belgard
Bublitz
Rummelsburg
Stargard
Butow
Behrent
Dirschau
Lauenburg
Neustadt
Leba
Putzig
Stolpmunde
Rugenwalde
Schlawe
Stolp
Rugen I.
Hela
Pillau
Memel
Tilsit
Insterburg
Gumbinnen
Pillkallen
Goldap
Lyck
Lotzen
Oletzko
Rastenburg
Angerburg
Johannisbur

marks. The estimate for the navy was 442,176,342 marks. A mark is equivalent to 23.8 cents. The debt of the empire is of no great amount.

Constitution.—The constitution of the German Empire is based upon the decree of the 16th of April, 1871, which took effect on the 4th of May following. The presidency of the empire belongs to the crown of Prussia, to which is attached the hereditary title of *Emperor of Germany*. The prerogatives of the emperor are to represent the empire in its relation to other states, to declare war if defensive, and conclude peace in name of the empire, to contract alliances, etc. The emperor has also the supreme command of the army and the navy, appoints and dismisses officials of the empire, appoints consuls, and superintends the entire consulate of the empire. The legislative authority is vested in the Bundesrath (Federal Council) and the Reichstag (Imperial Diet), the former consisting of 58 representatives of the different states of the empire, 17 from Prussia, 6 from Bavaria, 4 each from Saxony and Würtemberg, 3 each from Baden and Hesse, 1 from Saxe-Weimar, etc. The Reichstag consists of 397 deputies elected by secret voting in all the states of the empire.

Army and Navy.—Service in the army or navy is obligatory on every man in Germany from the 1st of January of the year in which he completes the twentieth year of his age to the end of his forty-second year, unless he be released altogether, or for times of peace, by the competent authorities. Seven years must be spent in the standing army or fleet (three of them in active service in the cavalry and two in the infantry, and the remainder in the reserve). The next five years are passed in the Landwehr, the members of which may be called out only twice for training during that period. All men capable of bearing arms who are not in the line, the reserve, or the Landwehr, must belong to the Landsturm, which is called out only in case of invasion of the territory of the empire. Young men above seventeen years of age who are able to pass an examination upon general subjects, and who volunteer for active service in the army, and agree to equip and maintain themselves during the time that their active service lasts, are admitted into the reserve after one year's continuous service. The peace strength of the army, in 1915, was 870,000 men, and the total war strength of trained soldiers 5,400,000. The German navy consisted, in 1915, of 100 battleships and armored cruisers, 308 torpedo boats and destroyers, and was being rapidly added to, especially with battleships of great size and power.

Religion and Education.—While the Roman Catholic Church is strong in Germany, having a membership of more than 20,000,000, the Protestant denominations are greatly in the lead, having nearly double this membership. There are also over a half million of Jews. Education is compulsory throughout Germany. Every commune or parish must support at its own cost a primary school. Every town in addition must maintain one or more middle schools, which supply a higher education than the elementary schools. Above these are *real schools* (*Realschulen*) giving a still higher education, institutions of similar standing called *gymnasiums*, giving an education in which the ancient languages form a more important element, and, above all, the universities, of which there are 21 in the country, the chief being those of Berlin, Leipzig, and Munich. The Germans as a whole are perhaps the best educated people in the world.

History.—The date of the first arrival of the Germanic or Teutonic races in Europe is unknown. At the close of the second century B. C. Germanic tribes called Cimbri and Teutones left their homes in the Danish peninsula, and descending upon Italy, were defeated by Marius at Aquæ Sextiæ (Aix in Provence) and Vercellæ in Northern Italy. The Romans did not again come in contact with the Germans till Cæsar's invasion of Gaul brought on a contest with the Suevian prince Ariovistus (58 B.C.). At that time several German tribes had crossed the Rhine and settled in the district between that river and the Vosges Mountains, while others had pushed their way through what is now Belgium. The Germans on the left bank of the Rhine were soon subjugated, and two expeditions were made by Cæsar across the Rhine. Under Augustus a systematic attempt was made to subjugate the vast and little-known region of Germania, extending between the Rhine and the Vistula, and from the Danube to the North Sea. Tiberius reduced all the tribes between the Rhine and the Elbe, but a few years later there was a revolt, in which three Roman legions under Varus were annihilated by Arminius, leader of the Cherusci, about 9 A.D. The attempt to subjugate the Germans was given up by Augustus; and Germanicus, although he avenged the defeat of Varus by a succession of campaigns, failed to recover the Roman ascendency. About this time each tribe or nation among the Germans is described as having been di-

vided into four classes: 1. The nobles, from whom the kings and chiefs of the districts were chosen. 2. The freemen, who, with the nobles, had the right to choose their residence and hold heritable property, and who formed the chief strength of the armies and voted in the popular assemblies. 3. The freedmen, a middle class between freemen and slaves, who had no landed property, but farmed the land; they were not admitted to the popular assemblies. 4. The slaves, who were entirely in the power of their masters. In religion the Germans were polytheists. Among their great gods were Woden (or Odin), Donar (Thor), Thiu (Tyr), Frigga, etc. They erected no temples and had no idols, but believed in a future life and in eternal justice.

As the aggressive force of the Roman empire abated, it continued to be more and more subject to the incursions of the Germans, who by the end of the fifth century had overrun Gaul, Italy, Spain, and part of Africa. After this Germany itself continued in a divided state till it came under the single rule of Charlemagne. (See *France.*) The history of the German Empire proper commences with the Treaty of Verdun (843 A.D.), which separated the land of the Eastern Franks under Ludwig the German from that of the Western and Central Franks. Out of Ludwig's kingdom was developed the German nationality. Charles the Fat became emperor in 881, and three years later was also elected king of the West Franks, thus again uniting under one scepter the monarchy of Charlemagne. After his deposition in 887 the two territories of the Eastern and Western Franks were again separated, the former electing Arnulf as their king. He died in 899, and was succeeded by his infant son Louis, who was proclaimed King of Lorraine in 900, assumed the title of emperor in 908, and as such is designated Louis IV. He died in 911, and the German nations chose Conrad, Count or Duke of Franconia, as his successor. He died in December, 918, of a wound received in battle with the Huns. In 919 Henry the Fowler, Duke of Saxony, was elected. He was succeeded by his son, Otto the Great in 936, who revived the empire of Charlemagne, receiving the crown of Holy Roman Empire from the pope in 962. He died in 973, and was succeeded by his son, Otto II, who had been crowned emperor by the pope in his father's lifetime. Henry II, Duke of Bavaria, surnamed the Saint, the hereditary heir of the Saxon line, was elected at Mainz, on the death of Otto in 1002, crowned emperor in Rome 1014, and died in 1024. With him ends the Saxon line of emperors.

Conrad II, surnamed the Salic, a Franconian nobleman, was chosen to succeed him. He spent several years in Italian wars, defeated the Poles, and restored Lusatia to the empire. He died in 1039. He was succeeded by his son, Henry III, who had been chosen in his lifetime, and who, the imperial power being now at its highest point, exercised more despotic authority in Germany than any of his predecessors. The fruits of his policy were lost by his son, Henry IV (1056-1106). In his reign occurred the famous quarrel with the pope regarding investitures, which ended in Henry having to humble himself before the pope at Canossa. His life was embittered by contests against rival emperors and later by the defection to the papal party of his own son Henry, by whom he was eventually deposed. Henry V (1106-25) inherited, however, the quarrel of the investitures, took Pope Paschal II prisoner, and was excommunicated by seven councils. At length the question of investiture was settled by the Concordat of Worms (1122). On his death there was a contested election and a civil war between Lothaire, Duke of Saxony, and Conrad of Hohenstaufen, in which the former was successful.

A contest was now begun between the Saxon and Hohenstaufen (Suabian) families, in which the celebrated party names Guelf and Ghibelline originated. On the death of Lothaire in 1138 Conrad III (of Hohenstaufen) was chosen to succeed him. Conrad died in 1152, and was succeeded by his nephew Frederick Barbarossa (which see). His son, Henry VI, began his reign with a war in Southern Italy. He conquered Sicily, and was crowned king of it in 1194. He died at Messina in 1197. Philip, brother of Henry, and Otto IV, were elected by rival factions in 1198. Philip, who was successful, was assassinated in 1208. Otto IV, the son of Henry the Lion, was recognized by the Diet of Frankfort in 1208 as the successor of Philip. He attempted the conquest of the Two Sicilies without success, and died in 1218. Frederick II, King of the Sicilies, was elected emperor in 1212. His life passed in contentions with the popes and the Lombard cities. He died in 1250. Conrad IV, his son, had to contend against William of Holland. He died in 1254. He was the last emperor of the house of Hohenstaufen, which became extinct on the death of his son. His successor, William of Holland, was slain in Friesland in 1256. Richard, Earl of Cornwall, and

Alfonso X, King of Castile, were chosen emperors in 1257; but the internal divisions of Germany had already deprived the office of all authority, and neither of them had any power. Until 1273 the German Empire had no real head.

Rudolph, Count of Hapsburg and Cyburg, the most powerful prince in Helvetia, was chosen emperor in 1272, and under him and his successors the status of the empire was restored. He enriched his own family by his victories over the King of Bohemia, and acquired Austria, Styria, and Carinthia as imperial fiefs for his sons Albert and Rudolph. He died in 1291. Adolphus of Nassau, his successor, was deposed in 1298 by the Diet of Mainz. Albert I, son of Rudolph, was chosen emperor the same year. He is chiefly celebrated for his wars with the Swiss as Duke of Austria, which led to the independence of Switzerland. He died in 1308, and was succeeded by Henry VII of Luxembourg, who, during nearly the whole of his reign, lived in Italy, where he died in 1313. In 1314 a double election took place, Frederick, Duke of Austria, sometimes called Frederick III, was elected along with Louis of Bavaria. On the death of Frederick in 1330 the latter became sole emperor. He died excommunicated and deposed in 1347. Charles IV, King of Bohemia, was elected in 1346. His reign is chiefly distinguished for the Golden Bull (1356) regulating the electorate. (See *Golden Bull.*) He died in 1378. Wenceslaus, his son, was deposed for his excesses in 1400. Rupert, Count Palatine, elected in 1400, possessed little authority. Sigismund, King of Hungary and Bohemia, son of Charles IV, was elected by a party in 1410. His reign is distinguished by the commencement of the Reformation in Bohemia, by the Council of Constance, and the condemnation of Huss and Jerome. He died in 1437. Albert II (V of Austria) was elected in 1438, and died in 1439. He was succeeded by Frederick III, Duke of Styria and Carinthia. He was the last emperor who was crowned in Rome. Thenceforth the German emperors were always of the house of Austria. He died in 1493. His son, Maximilian I, succeeded. During his reign the Diet of Cologne was held, which divided the estates of the empire into ten circles for the better maintenance of the public peace.

During the period here briefly reviewed the empire had undergone many changes. At the extinction of the Carlovingian dynasty Germany was divided into five nations or dukedoms—Franconia, Suabia, Bavaria, Saxony, and Lorraine. Henry the Fowler and the Ottos added the marches of Austria and Misnia; Henry the Lion and Albert of Brandenburg added Mecklenburg and Pomerania. The house of Austria added Styria, Carinthia, Carniola, and the Tyrol. But Switzerland had been lost, and the old Burgundian territories of the empire, Franche Comté, the Lyonnais, and Provence, had gone to consolidate the French monarchy under Louis XI. Bohemia and Hungary, and many of the Italian cities, especially in the north, were also connected with the empire, but the connection was more formal than real, and the circles established by the Diet of Cologne (1512) represented at that time the estates of the empire, viz.: 1. Austria, 2. Bavaria, 3. Suabia, 4. Franconia, 5. the Upper Rhine (Lorraine, Hesse, etc.), 6. the Lower Rhine, or the Electorates (Mainz, Trier, Cologne), 7. Burgundy (Netherlands), 8. Westphalia, 9. Lower Saxony (Brunswick, Lüneburg, Lauenburg, Holstein, etc.), 10. Upper Saxony (Saxony, Brandenburg, Pomerania, etc.).

The chief political machinery of the empire was connected with the diet, or administrative assembly. The exact constitution of the early German diets is not known. In the 12th century the counts of the empire became distinguished from the princes, and lost the right of voting in the diets. The election of an emperor was at first undertaken by the whole diet. In the 13th century the number of electors was restricted to seven, to which two more were afterwards added. (See *Elector.*) The diets were called by the emperor at his own pleasure, but as they had the power of granting supplies their meetings were frequent; and as their authority over the different states was partial, and their policy could only be carried out by the executive force of the emperor, they can hardly be regarded as an independent power in the state. Neither the time nor the place of meeting of the diets was at first fixed. From an early period the cities of Germany were represented in the diet. In early times they generally supported the authority of the emperor, as their interest was common with his in diminishing the power of the greater vassals. Municipalities were at first established about the reign of Frederick I. and soon began to assert their independence. The predatory habits of the nobles, besides the claims of superiority over entire cities or particular citizens asserted by the princes, involved the cities in continual warfare with the feudal nobility, and often also with their ecclesiastical superiors. The

necessity of defending their privileges compelled them to enter into leagues among themselves. Among the earliest of these combinations was the Hanseatic League, formed to resist both the oppression of rulers and the depredations of land and sea robbers. A league was formed in 1255 by more than sixty cities of the Rhine, headed by the three ecclesiastical electors, to resist the depredations of the lesser nobles. The Suabian League, formed in 1376, was of similar origin. These leagues were met by counter-associations of nobles and princes.

Maximilian, who succeeded to the empire in 1493, was succeeded in 1519 by his grandson Charles V. (See *Maximilian I, Charles V.*) The reign of Charles, the most important in the German annals and the most brilliant in the 16th century, was divided among three great conflicts—the continued struggle between France and Germany, the conflict with the encroaching Ottoman empire, and that with the Reformation. In 1556 Charles resigned the empire to his brother Ferdinand. The Council of Trent was concluded in Ferdinand's reign. He died in 1564. Then followed Maximilian II, Rudolph II, Matthias and Ferdinand II. By this time was begun a religious war, by which Germany was devastated for thirty years, hence called the Thirty Years' war.

The invasion of Germany by Christian IV of Denmark in 1625, the Peace of Lübeck (1629), the invasion of Gustavus Adolphus (1630), the battles of Leipzig in 1631, of the Lech and Lützen in 1632, of Nördlingen in 1634, the war with France in 1635, belong to the history of the Thirty Years' war (which see). Ferdinand died in 1637, and was succeeded by his son, Ferdinand II. The latter had gained a military reputation by the battle of Nördlingen, but Banér, Bernhard of Saxe-Weimar, Torstenson, Turenne, and the Great Condé gained repeated victories over his troops. He was at length induced to enter into negotiations; and the Thirty Years' war was concluded by the Peace of Westphalia (24th October, 1648), in which the policy of France and Sweden was triumphant. The principal conditions which concerned Germany were a general amnesty and restoration of rights. France received definitely the bishoprics of Metz, Toul, and Verdun, with Breisach, Upper and Lower Alsace, and ten imperial cities in Alsace. Sweden received Rügen, and Hither Pomerania and part of Farther Pomerania, with some other territories. Greater power was given to the Protestants and the right of the princes and states to make war and alliances among themselves or with foreigners was recognized.

The emperor died in 1657. His son, Leopold I, was elected emperor in 1658. The success of Louis XIV in his invasion of Holland led to a coalition against him, in which the emperor joined (1673). The war was continued for some years, and terminated by the Peace of Nimeguen, 1679. The League of Augsburg, in which the emperor joined, led to a second protracted war with France, which was concluded by the Peace of Ryswick. In 1692 the emperor erected Hanover into an electorate, and in 1700 he permitted the Elector of Brandenburg, Frederick III, to take the title of King of Prussia. The war of the Spanish Succession, in which Great Britain, Holland, and the empire were leagued against France, was begun in 1702. To it belong the victories of Marlborough and Eugene (Blenheim, Oudenarde, Malplaquet). The Emperor Leopold died in 1705. He was succeeded by his son, Joseph I, who died in 1711. Joseph was succeeded by his brother, Charles VI. (See *Charles VI.*) The alliance against France was dissolved by the Peace of Utrecht in 1713, to which the emperor refused to accede, and was left alone against France. After a brief campaign between Prince Eugene and Villars he acceded to the Treaty of Rastadt, negotiated between these commanders, 7th March, 1714. The Spanish Netherlands, and Naples, Milan, Sardinia, and other Italian conquests were left to the emperor. Having no male heirs, Charles had promulgated in 1713 the Pragmatic Sanction, regulating the succession to his hereditary dominions in favor of his daughters in preference to those of his brother, Joseph I. He died in 1740. Charles Albert, elector of Bavaria, son-in-law of Leopold I, got himself chosen emperor (as Charles VII) in 1742. He laid claim to the hereditary possessions of the House of Austria, and entered into an alliance with France, Spain, Prussia, etc., against Maria Theresa, daughter of Charles VI. But he died in 1745, and Francis I, Grand-duke of Tuscany, the husband of Maria Theresa, was elected emperor; thus the House of Hapsburg-Lorraine, which had succeeded to the hereditary possessions of Austria, was recognized as the head of the empire. After a brief interval there took place the Seven Years' war (1756-63), in which Austria, Russia, France, and Saxony combined against Prussia, then ruled by Frederick the Great. The Peace of Hubertsburg (15th Feb., 1763) concluded the war, Prussia retaining her acquisitions. In 1765 Joseph II succeeded to

the imperial crown, becoming at the same time co-regent with his mother of the Austrian hereditary dominions. He joined with Russia and Prussia in the first partition of Poland (1772). He was succeeded by his brother Leopold, who, dying in 1792, was succeeded by his son, Francis II. He joined in 1793 in the second partition of Poland. He took the command of his army against the French in 1794, concluded the Peace of Campo Formio with Bonaparte (17th October, 1797) joined the second coalition against France in 1799, and concluded the Treaty of Lunéville (3d February, 1801); joined the third coalition in 1805, and concluded the Treaty of Presburg (26th December, 1805). In 1804 Francis took the title of hereditary Emperor of Austria, renouncing two years later that of head of the German Empire, which, indeed, had ceased to exist, owing to the conquests of Napoleon.

The States of Germany were again united by the Treaty of Vienna (1815), in a confederation called the German Confederation (der Deutsche Bund). In 1818 a general commercial league, called the Zollverein, was projected by Prussia, and was gradually joined by most of the German states, exclusive of Austria. Revolutionary outbreaks caused great disturbances in various German states in 1830 and 1848, particularly the latter. The German diet was restored in 1851 by the efforts of Prussia and Austria, who became rivals for the supremacy in the confederation. In 1866 the majority of the diet supported Austria in her dispute with Prussia respecting the disposal of the duchies of Schleswig and Holstein, whereupon Prussia withdrew from the confederation and declared it dissolved. The Seven Weeks' war between Austria and Prussia ended in the defeat of the former, the loss of her Italian possessions, and her exclusion from the German Confederation, which was re-formed by Prussia under the title of the North German Confederation. After the Franco-German war (which see), in which the South German States, as well as the North German Confederation, supported Prussia, King William of Prussia was proclaimed German Emperor at Versailles on 18th January, 1871, the new empire comprising all the German States with the exception of Austria. The parliament of the new German Empire met at Berlin on 21st March, and adopted the new constitution. William I died in 1888 and was succeeded by his son Frederick, who, however, died in the same year from a cancerous affection in his throat, and was succeeded by his son as William II. Since the unity of the empire was attained endeavors have been made to establish a colonial empire, principally in Africa, including German East and Southwest Africa and a large tract of land in the region of the French Congo, adjoining the German Kamerun protectorate.

In Polynesia, Germany acquired a portion of New Guinea, the Bismarck Archipelago, and some of the Solomon and Marshall Islands. It had also taken possession of a seaport region of northern China, with the surrounding inland section. In 1914 it took up the quarrel between Austria and Servia, fomenting a war in which the leading nations of Europe became engaged, and subsequently those of Asia and America. As regards the colonial possessions of Germany, above mentioned, it will suffice to say here that they were all lost in consequence of the war. For the conflict that followed the Servian trouble, the greatest, in several respects, in the history of the world, Germany was amply prepared, having been transformed into a military machine without equal elsewhere on the earth. For a century it had been developing its system of militarism, and, by 1914, the nation had become a trained army, of unequaled efficiency, while its military equipment was, in many respects, complete. Austria, its chief auxiliary in the war, was also in good fighting order, but the same was the case with its neighboring enemies, France and Russia, which had followed the example of Germany in developing a system of militarism. This was not the case with Britain, which had no system of conscription or general training. But, on the other hand, it had the decided advantage of possessing much the greatest naval force in the world, this giving it control of the sea so far as surface navigation was concerned. Such was the position of Germany and its chief enemies when the great European War began in August, 1914. The kaiser, William II, had complete military control of the national Teutonic fighting machine and had long cherished an ambition to lift Germany to the position of autocrat over the nations of the world. At all events, such was apparently the case, it being a very widespread opinion that Kaiser William had made the murder of the Austrian Archduke the pretext for plunging all Europe into war for purposes of his own. In the diplomatic correspondence that followed, the voice of Austria is scarcely heard, the dealings of Russia, France and Britain being with Germany alone.

Germany took the opening part in the

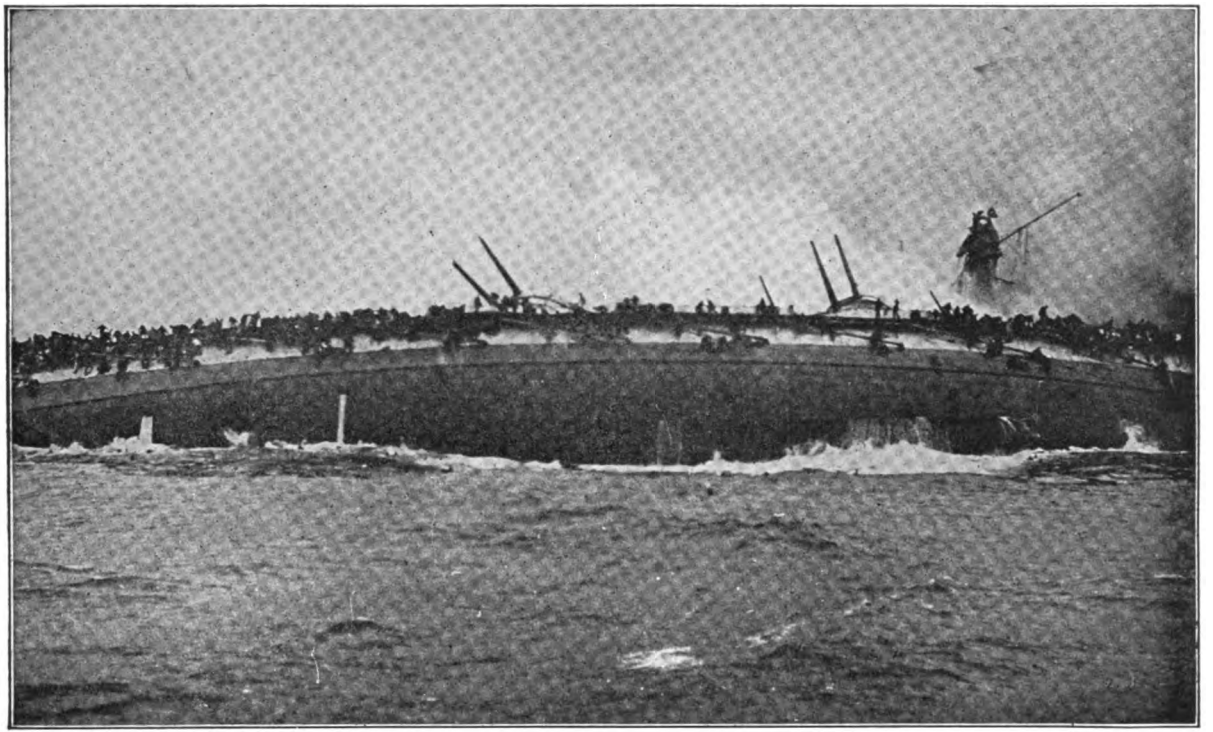
war that was thus forced upon Europe, the vanguard of its army being across the border of Belgium before the exchange of diplomatic notes had ended and war been openly declared. This hasty action was taken advisedly, the purpose being to invade France by a flank attack through Belgium before it could get its army effectively into the field. Belgium, small as it was, defeated this scheme, holding back the invaders while the work of mobilization in France went actively on. When the German invaders at length crossed the French frontier, a powerful and well-equipped army was ready to meet them. At first, indeed, it seemed as if the debacle of 1870 was to be repeated, the French forces, with their small British contingent, falling back before the vigorous German advance until the banks of the Marne were reached and the outer defenses of Paris brought almost within cannon range. Then, with a powerful reverse movement, the armies of France were hurled upon their foes and the German forces driven irresistibly back until their line of defense on the Aisne was reached. Here a trench line had been prepared and at this point began the system of trench warfare which was to be continued in that quarter for years. Thus ended in repulse and defeat the great drive by which the German military leaders hoped to repeat the work of 1870. It was their last advance on French territory. From that time forward the progress of the war in Belgium and France consisted in trench fighting on a long frontier line on which success lay with the French and their British auxiliaries.

We must deal more briefly with the events of the war in other fields. On the eastern frontier the large army of Russia was quickly in the field, successfully at first, but meeting with disastrous defeat in the invasion of Poland by the army under Von Hindenburg. Warsaw was lost and the Russians driven out of the Carpathian region. The revolution that eventually overthrew the imperial government of Russia so utterly disorganized that country that its armies practically ceased to exist, and propositions for an armistice between the extremists who gained control of the Russian government and the astute German diplomats were made. Another field of warfare in which Germany took active part was that of Italy, the armies of which had made marked advances upon Triest and Trent, during two years of persistent war with the Austrians. In November, 1917, a strong German army came to the aid of the Austrians and so effectively that the Italians were driven back in wild retreat, losing very heavily in prisoners and munitions. This reverse movement continued until the end of November, when the Italians halted on the line of the Piave River, where, reinforced by British and French troops, they began to hold their own and check their tumultuous retreat.

The war with Britain took place in two fields, that of western Belgium, where the British and their colonial aids gradually pushed back the Germans, and on the ocean, where the German fleet was held, during most of the war, in harbor, but where immense damage was done to the British commercial service by a large number of submarines, these sinking hundreds of merchant ships laden with food and munitions. It was their purpose to starve England. This country in return sought to starve Germany by a close embargo.

German Language.—German is one of the Teutonic languages, of Aryan or Indo-European stock. Of these, the Gothic, now long extinct, presents us with the earliest specimens of any Teutonic speech that we possess in the fragments of a translation of the Bible made by Bishop Ulfilas about A.D. 360. Anglo-Saxon comes next; German follows somewhat later. The German dialects spoken in the lower and more northern localities have long exhibited considerable differences from those spoken in the higher and more inland, thus giving rise to the distinction between High German and Low German. Middle High German became literary in the twelfth century, its poetry giving it a predominance as far as Austria. The following century Suabian was the predominant dialect, and its influence is apparent in all the writings of the fourteenth and fifteenth centuries. Ultimately Upper Saxon became the language of literature and cultivated society in consequence of the translation of the Bible by Luther, which may be said to have fixed the New High German.

German Literature.—The literature of Germany received its first impulse from the fondness of the early Germanic races for celebrating the deeds of their gods and heroes. According to Tacitus, the warriors would advance to attack chanting wild war-songs. Of these early songs nothing even in a translated form has been handed down to us. The legends immediately connected with the Gothic, Frankish, and Burgundian warriors of the period of national migration—Dietrich (Theodoric) Siegfried, Hildebrand, etc.—have for the most part some historical foundation, and many of them were eventually incorporated in the *Nibelungenlied*,



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SINKING OF THE GERMAN CRUISER BLUECHER

This most dramatic photograph of the Great North Sea Battle, in which the British fleet was victor January 24, 1915, shows the death agony of the German cruiser Bluecher just as she turned turtle and sank. The ship is shown lying on her side with her machinery and armament shot into masses of twisted iron and steel, great fires raging forward, amidship and aft.

the most celebrated production of German mediæval poetry. On the introduction of Christianity was opened another sphere of literary activity. Metrical translations of the Evangelists, the *Krist* and *Heliand*, appeared in the ninth century in the High and Low German dialects, respectively. The *Ludwigslied*, a pæan in honor of the victory of Louis III, king of the Franks, over the Normans in 883, was composed in Old High German by a Frankish ecclesiastic. The preservation of the *Hildebrandlied* is also due to churchmen, who transmitted it partly in the High and partly in the Low dialect. The *Merseburger Gedichte*, two songs of enchantment written in the tenth century, throw light on the ancient religious beliefs of Germany; but in general the hostility of the clergy to the old pagan literature of heroic legends, beast-fables, etc., was not favorable to its preservation.

In the twelfth and thirteenth centuries poetry passed from the monasteries and ecclesiastical schools to the palaces of princes and the castles of nobles. Under the cultured emperors of the house of Hohenstaufen the first bloom of German literature came. Many of the poets of this period were nobles by birth, some of them even princes. Heinrich von Weldeke was the first to introduce into his heroic poem *Eneit* that spirit of devotion to women called by the old Germans *Minne* (Love, hence the name *Minnesänger*, Love-Minstrel). A still greater name is that of Wolfram von Eschenbach, the author of *Parzival*, a poem embodying the legends of King Arthur, the Knights of the Round Table, and the San Graal (Holy Grail). These traditions, together with the exploits of Charlemagne, of Alexander the Great, and the Trojan heroes, inspired also the lays of Gottfried of Strasburg, Hartman von der Aue, and others. These subjects were all taken from the romances of the French *trouvères*, and treated in a style closely resembling theirs. But we have besides real national epics in the *Nibelungenlied* and *Gudrun*. (See *Nibelungenlied, Gudrun*.) The lyrics or minnesongs of this period are not less remarkable than its romances and epics. Perhaps the most gifted lyrist is the celebrated Walther von der Vogelweide. Next to him rank Heinrich von Ofterdingen, Reinmar der alte, and the Austrian poets Nithard and Tannhäuser. Several hundreds of these poets were engaged in traveling from palace to palace and from castle to castle, in the manner of the troubadours of Provence. Their songs were mostly in the Suabian dialect, and the poets constituted what is called the Suabian school. In the thirteenth century didactic poetry began to be cultivated with some success. The dawn of historical literature is heralded by the chronicles of Limburg (1336-98) and of Alsace (1386), but the age of chivalry, as Ulrich von Lichtenstein complained in his poem *Frauendienst*, was declining. During the troublous times of the Interregnum (1256-73) poetry passed to the homes of the private citizen and the workshops. These plebeian songsters formed themselves into guilds in the imperial cities—Nürnberg, Frankfort, Strasburg, Mainz, etc., and were called *Meistersänger*, in contradistinction to the knightly *Minnesänger*.

In the fourteenth century Germany produced several mystical theologians, disciples of Meister Eckhart, the most celebrated of whom were Tauler and Suso, whose sermons and writings paved the way, in some measure, for the Reformation. The only good poetry in the fourteenth, and up to the close of the fifteenth century, were the spirited lays of Halb Suter and Veit Weber, who celebrated the victories of Switzerland over Austria and Burgundy. The invention of printing caused an increasing literary activity, and the works printed in Germany between 1470 and 1500 amounted to several thousand editions. In 1498 there was published the celebrated beast-epic *Reineke Vos* ('Reynard the Fox'). Other popular works were the *Narrenschiff* ('Ship of Fools') of Sebastian Brandt, an allegorical poem in which the vices are satirized; The *Satires* of Thomas Mürner; and (in 1519) *Till Eulenspiegel*, a collection of humorous stories about a wandering mechanic.

In the sixteenth century a new era opens in literature with Luther's translation of the Bible. The writings of Luther, Zwingli (1484-1531), Sebastian Frank (1500-45?), Melanchthon (1497-1560), Ulrich von Hutten (1488-1523), one of the chief writers of the *Epistolæ Obscurorum Virorum*, constitute the principal theological literature of the Reformation. History was now written in a superior style, and with greater comprehensiveness, by Frank in the *Zeitbuch* and *Weltbuch*, and by Sebastian Münster (1489-1552) in his *Kosmographie:* also by Tschudi (1505-72) in *Chronicles of Switzerland* and by Aventinus (1477?-1534), the Bavarian chronicler. The autobiography of Götz von Berlichingen also deserves mention as a sketch of the rude lives of the smaller nobility. Among the poets of this period Hans Sachs (1494-1576), the cobbler of Nurem-

berg, the greatest of the Meistersänger, and Johann Fischart (died 1589), a great satirist, and author of *Das glückhafte Schiff*, stand much above their contemporaries. Many of the hymns and religious lyrics of the age are of high merit, particularly those of Luther, Eber, Waldis, and others. The drama also made considerable progress, Hans Sachs, before mentioned, and Jakob Ayrer (died 1605) being amongst the best writers in this department. But it was in learned and scientific treatises that the age was most prolific. Amongst the chief names in this respect are Luther, Camerarius, Cornelius Agrippa, Paracelsus, Copernicus (astronomy), Leonhard Fuchs (botany and medicine), Conrad Gesner (zoology and classics), and Agricola (mineralogy).

By the beginning of the seventeenth century literature was on the decline. This century is known in German literature as the period of imitation. Most of the poets were graduates of universities; and learned societies were formed for the purpose of improving the language and literature. A new school of poetry, known as the first Silesian school, was founded, of which Martin Opitz (1597-1639) was the leader. His works are more remarkable for smoothness of versification than for true poetic inspiration. As a critic his work *Die Deutsche Poeterie* became a kind of manual for verse makers. Amongst the chief members of the Silesian school were Simon Dach (1605-69), von Zesen (1619-89), Johann Rist (1607-67), and, greatest of all, Paul Fleming (1609-40), whose lyrics are natural and cheerful as the songs of a lark. Of this school also was Andreas Gryphius (1616-64), who may be said to have founded the regular German drama. The second Silesian school, headed by Hoffmann von Hoffmannswaldau (1618-79), and Lohenstein (1635-83), carried affectation to its utmost. Both the Silesian schools were opposed by the 'court poets,' Canitz (1654-99), Besser (1654-1729), and many others who imitated the French school and took Boileau for their guide. Germany's greatest hymn-writer, Gerhardt (1606-75), belongs to this period. Among the best satirists and epigrammatists were Logau (1604-55) and Lauremberg (1591-1659). Amongst novelists Moscherosch, with his *Geschichte Philanders von Sittewald*, and Grimmelshausen in his *Simplicissimus* give graphic pictures of life during the Thirty Years' war. Amongst the scientific and philosophic writers of the period we may mention Kepler (1571-1631), Pufendorf (1632-94), the publicist, and Jakob Böhme (1575-1624), the great mystic who stood almost alone in using the vernacular in communicating philosophical instruction. Leibnitz (1646-1716) was the first to lay a scientific basis for the study of philosophy, but his works were composed chiefly in French and Latin. Wolff (1679-1754), his disciple, shaped the views of his master into a comprehensive system, and published his works in the German language.

In the eighteenth century poetry revived with Haller (1708-77), remarkable as a descriptive poet, and Hagedorn (1708-54), a lyrist of considerable merit. The Saxon school headed by Gottsched (1700-66) aimed at a reformation of German poetry in the direction of French clearness and correctness, modeling the drama as far as possible on the works of Corneille and Racine. These tendencies brought about a violent controversy with a group of writers in Zürich, known as the Swiss school, and headed by Bodmer and Breitinger, who took the English poets as their model, and laid stress on the function of imagination and feeling in poetry. The result of the controversy was that most of the young writers at Leipzig shook off the authority of Gottsched, and even established a periodical (*The Bremer Beiträge*) in which the principles of their former master were attacked. Among the contributors were Rabener (1712-91), a popular satirist with a correct and easy style; Zachariä (1726-77), a serio-comic epic poet; Gellert (1715-69), the author of numerous popular hymns, fables, and a few dramas now forgotten; Kästner (1719-1800), a witty epigrammatist and talented mathematician; Giseke, Cramer, Fuchs, Ebert, and many others of more or less note. To the school of Halle belonged Kleist (1715-59), Gleim (1719-1803), a celebrated fabulist, and others. Gessner of Zürich (1730-87) gained in his time a high reputation as a writer of idyls. With the writings of Klopstock (1724-1803) and Wieland (1733-1813) the classical period of German literature (usually reckoned from 1760) may be said to begin. Though the epic poem of the first (*Messias*) is no longer counted a poem of the first rank, yet Klopstock's work, with its ardent feeling for the spiritual and sublime, is recognized to have had a beneficent effect on German literature. Wieland, a striking contrast to Klopstock, awakened with his light and brilliant verse a greater sense of gracefulness in style. But it was reserved for Gotthold Ephraim Lessing (1729-81) to give a new direction to German literature. He established a new school of

criticism and dealt the fatal blow at French influence. His tragedy, *Emilia Galotti*, his comedy of *Minna von Barnhelm*, and his philosophic drama *Nathan der Weise*, were the best models of dramatic composition which German literature had yet produced, and his direction of the German mind toward Shakespere and the English drama was not the least of the many impulses he contributed to the literary growth of his countrymen. Herder (1744-1803), with his universal knowledge and many-sided activity, followed Lessing as another great influence in the literary world. The researches of Winckelmann (1717-68) in ancient sculpture led to a new understanding of art, as those of Heyne in ancient literature mark the development of modern German scholarship. A union of the students at Göttingen University, where Heyne taught, gave rise to the *Göttinger Dichterbund* or *Hainbund*, among the members of which were Gottfried Aug. Bürger (1748-94), author of *Lenore* and other wild and picturesque ballads and songs; Voss (1751-1826), the translator of Homer, and author of one of the finest German idyls, *Luise*, together with the two brothers Stolberg, Boie, Hölty, Claudius, etc.

This period was followed by a time of transition and excitement known in Germany as the *Sturm-und-Drang Periode* (Storm and Stress period), which found its fullest expression in an early work of Goethe's (1749-1832), the *Sorrows of Werther*. The literary excitement was raised to the highest pitch by the *Räuber* ('Robbers') of Schiller (1759-1805), afterwards the friend and coadjutor of Goethe. By the joint exertions of these two great men German literature was brought to that classical perfection which, from a purely local, has since given it a universal influence. Of a highly individual character are the works of Jean Paul Richter (1763-1825), a writer of profound humor and pathos; and Jung Stilling (1740-1817), whose autobiography holds a peculiar place in German literature for the charming naïveté of its thought and style. In the departments of science and philosophy, we have the names of Moses Mendelssohn (1729-1786); A. G. Baumgarten (1714-62), the founder of the science of æsthetics; the historians Mosheim (1694-1755), Dohm, Möser, Spittler, Johannes Müller; Adelung, the philologist; Basedow and Pestalozzi the educationalists; Ernesti, Spalding, Rosenmüller, and Michaelis, theologians; Eichhorn in theology and universal and literary history; and the scientific writers Blumenbach. Euler, Vega, Herschel, and others. In the field of pure metaphysics Immanuel Kant (1724-1804), was succeeded by Fichte (1762-1814), Hegel (1717-1831), and Schelling (1775-1854).

Partly produced by the influences of the *Sturm-und-Drang* period, and partly trained in the laws of art laid down and worked out by Goethe and Schiller in their many famous and admirable works, the so-called *romantic school*, distinguished by its enthusiasm for mediæval subjects and its love of what is mysterious and transcendental in life or thought, gradually succeeded in gaining public attention about this epoch. Amongst the principal writers of this school after its two great leaders are von Hardenberg, better known as Novalis (1772-1801), a pensée-writer of deep poetic insight; Ludwig Tieck (1773-1853), a writer of tales, dramas, and dramatic criticisms; La Motte Fouqué, Clemens Brentano, Hoffman, Musæus, Werner, von Kleist, etc. The two Schlegels (August Wilhelm, 1767-1845, whose translation of Shakespere is still celebrated, and Friedrich, 1772-1829, best known by his philosophy of history) also belong to this school.

The war of liberation against Napoleon I introduced a strong manly enthusiasm for a time into the hitherto gloomy and melancholy productions of the romanticists. Among the patriotic poets of the time Ernst Moritz Arndt (1769-1860) and Theodor Körner (1791-1813) hold the first place. The ballads and metrical romances of Ludwig Uhland (1787-1872) brought him a world-wide fame. Friedrich Rückert (1789-1866) also may be noticed as a lyric poet of merit. During the excitement produced by the July Revolution in France (1830) a school of writers arose in whose works the social and political ideas of the time were strongly reflected. The most prominent names among this party are Ludwig Börne (1786-1837) and Heinrich Heine (1799-1856), whose writings combine the keenest satire and the finest pathos. Among the better known members of the school is Karl Gutzkow (1811-1878), a popular dramatist and novelist. As in England and France of late, the novel, especially the novel of a social or political character, has taken a prominent place in literature. Most distinguished are Gustav Freytag, Fr. Spielhagen, Paul Heyse, Berthold Auerbach, Fanny Lewald, Hackländer, Reuter, etc. Of late, however, science and learning rather than literature and the arts have produced the names of most eminence. Alexander von Humboldt (1769-1859), one of the first and

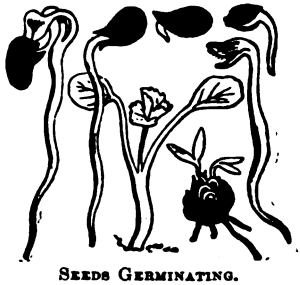
most eminent of these, gave a great impulse to almost all branches of knowledge by his *Cosmos*, his *Travels*, and his *Views of Nature*, and by the general suggestiveness of his labors. In history, Niebuhr and Theod. Mommsen, the historians of Rome; Leopold Ranke, the historian of the popes; Dahlmann, Gervinus, Sybel (French Revolution), Giesebrecht, Julian Schmidt, H. Kurz, and others may be mentioned. Biography has been well represented by Varnhagen von Ense, Pertz, David F. Strauss, and others. German modern theology and Biblical criticism has had lately much influence in the religious world. Baur, Bleek, and Ewald are some of the widely-known names. Histories of art have been written by Kugler, Burckhardt, Lübke, and others. The brothers Grimm—Jakob (1785-1863), Wilhelm (1786-1859), were the founders of a new branch of philological and poetic investigation in ancient German literature. Eminent names in general philological science are those of Bopp, Pott, Schleicher, Steinthal, and Friedrich Müller. In natural sciences, Oken, Burmeister, Carus, Cotta, Liebig, Helmholtz, Virchow, Schleiden, Grisebach, Vogt, Bessel, Brehm, Häckel, Bastian, etc., are the eminent names; in philosophy, Schopenhauer, Feuerbach, Rosenkranz, Kuno Fischer, von Hartmann, Lotze, etc. Amongst recent poets Anastasius Grün (pen-name of Count von Auersperg) and Nikolas Lenau amongst Austrian, and Meissner and Hartmann, natives of Bohemia, have a considerable reputation. Hervegh, Hoffmann von Fallersleben, Freiligrath, and Franz Dingelstedt have infused strong political sentiments into their poetry. Emmanuel Geibel, von Scheffel, Bodenstedt, and others represent a poetry more comprehensive in its aims and tendencies. To these might have been added numerous names of still later date, recent German literature having become very voluminous, though none of the existing writers have yet won eminence.

Germersheim (ger'-mĕrz-hīm), a town and fortress in the Bavarian Palatinate on the Rhine, 8 miles s. w. of Spe.ier. Pop. (1905), 5914.

Germinal (Fr. zhăr-mē-nal), the seventh month of the first French republican calendar, March 21—April 19.

Germinal Vesicle (jer'mi-nal), (*a*) in animal physiology, the nucleus of the ovum or egg of animals It contains within it a nucleolus called also the *germinal spot*. The germinal vesicle undergoes important changes in the early stages of the development of the egg into the embryo. (*b*) In botany a cell contained in the embryo sac, from which the embryo is developed.

Germination (jer-mi-nā'shun), the first act of growth by an embryo plant. The immediate causes of germination are the presence of moisture and atmospheric air and a certain elevation of temperature. Moisture softens the integuments of the seed and relaxes the tissue of the embryo; atmospheric air supplies oxygen and nitrogen; and a temperature which must be at least as high as 32° Fahr., by exciting the



SEEDS GERMINATING.
In center a plant which has newly appeared above ground.

vitality of the embryo, enables it to take advantage of the agents with which it is in contact. During germination various changes take place in the chemical constituents of the seed, and are usually accompanied with increase of temperature, as is seen in the process of malting. Along with these other changes commonly take place: a root is produced, which strikes perpendicularly downwards and, fixing itself in the soil, begins to absorb food; a growth upwards then commences and ends in the protrusion of a stem and leaves.

Germ Theory of Disease, the theory that certain diseases are communicated from an infected person to an uninfected one by living organisms which gain access to the body of the afflicted person by the air or food, or drink, and which, growing and multiplying in the body they invade, produce the changes characteristic of the particular disease. The period during which the living particles of contagious matter retain their vitality, like the rate of their growth and multiplication, varies in different cases, but it is limited in all. Few, if any, resist the destructive influence of a temperature of 300° Fahr., while most succumb at the temperature of 200° or even less, particularly if exposed for some

time. Many of them are capable, however, of withstanding great reduction of temperatures. Animal poisons generally are destroyed by boiling, and clothes, sheets, etc., infected, may be rendered pure by being exposed to a temperature of 300° Fahr. These living organisms are grouped together as microbes or micro-organisms, and are divided into different classes. The *micrococcus* is a round form about the 32,000th of an inch in size, and multiplies by fission. The *bacterium* is rod-shaped, about the 10,000th of an inch long, with rounded ends; it also multiplies by fission. The *bacillus* is a third form also rod-shaped, and somewhat larger than the bacterium. They often form long chains or threads, and increase by division and by spore formation. *Vibrio* and *spirillum* are somewhat similar forms; and, like the others, increase with a rapidity beyond conception. The connection between these micro-organisms and the various forms of zymotic disease has been thoroughly established. The only method of investigation that yields reliable results, is to separate the organism supposed to be the cause of the disease, and cultivate it outside of the body. Thus a drop of blood from a person suffering from a special disease, which contains the bacteria, or bacilli, etc., believed to be the producers of the disease, is placed in a flask containing a nourishing material, care having been taken to destroy all other organisms in the flask. The special microbe flourishes there, let us suppose. It is then cultivated in one flask after another through successive generations, only a single minute drop of the material in one flask being used to inoculate a succeeding one. In this way a pure cultivation is obtained, a cultivation, that is, containing the particular microbe and none other. If this is the true cause of the disease, then a drop of the solution containing it introduced into the body of an animal, capable of receiving the disease, ought to produce it, and the particular organism introduced should be found multiplying in the blood and tissues of the infected animal. Such a demonstration has been given of the cause of a few diseases. Dr. Koch, of Berlin, published in 1876 a paper giving a full account of the life history of the bacillus organism which had been observed in animals dead of splenic fever; and in 1877 the great French chemist, Pasteur, proceeded to investigate the subject, and his investigations conclusively support the germ theory of disease. In 1882 Dr. Koch, of Berlin, announced the discovery of a micro-organism in tuberculosis, sometimes called consumption when infecting the lungs. This is found not only in the lungs of persons who have died of tubercle, but also in the saliva of tubercular and consumptive patients, and multiplies also by spores. Thus it is that the spittle of a consumptive patient, even after it has dried up, may be capable of imparting the disease, owing to spores being scattered in the air. After the epidemic of cholera in Egypt in 1883, which spread to France and Italy, investigations were undertaken by French, German, and British commissioners. Dr. Koch detected a peculiar bacillus, shaped like a comma (,), in the intestines of persons who had died of cholera, in the discharges from cholera patients, etc. He believed that this bacillus was the active agent in the production of the disease. All investigation, in short, seems to point to the fact that every infectious or contagious disease is due to some form of micro-organism, and that there is one particular organism for each particular disease. Each organism produces its own disease and none other; and the special disease cannot arise unless its germ has gained entrance to the body. The channels through which these germs obtain entrance are innumerable, but they have one origin and one only, and that is a preceding case of disease. In the case of cholera and typhoid fever the deleterious microbes seem generally conveyed by impure drinking water; the germs of some other diseases appear to be transmitted by the air; others are conveyed by insects, as yellow fever by one species of mosquito, malaria by a second species, and sleeping sickness by the tsetse fly; even our common house fly is known to be a source of danger in this direction. The 'germ theory' affords the hope and suggestion of a method of diminishing, if not of getting rid of, such diseases altogether, and to some extent also indicates the direction in which their cure is to be sought. If the particular microbe of each contagious disease were known, the condition of its life and activity understood, there is great probability that its multiplication in the living body could be arrested, and the disease thus cured. Even without such knowledge, however, the germ theory indicates that the means for arresting the spread of contagious diseases and diminishing their occurrence consist in preventing the spread of the germs from an existing case of disease. It is well to state that the disease-bearing microbes are only a few of the many species known, the most of them being harmless and really of great benefit to mankind,

in various ways. Also to state that these organisms are not all vegetable, like the bacteria, some of them being animal. See *Disinfectant*.

Gérôme (zhā-rōm), JEAN LÉON, a French painter, born in 1824 at Vesoul. He went to Paris and studied under Paul Delaroche. In 1853 he traveled in the East. In 1855 the first of his great pictures, *The Age of Augustus* and the *Birth of Christ*, appeared, and four years later his picture of the Roman gladiators, *Ave Cæsar Morituri te salutant*. In 1861 he exhibited his celebrated *Phryne before her Judges*. In 1863 he was appointed a professor at the Ecole des Beaux-Arts. Many of

Jean Léon Gérôme.

his pictures have been exhibited in London, and his works are in great favor in England and the United States as well as in his native country. Besides those already mentioned the following are amongst the chief works of Gérôme: *Louis XIV and Molière*, *Death of Cæsar*, *The Plague at Marseilles*, *Rex Tibicen*, *L'Eminence Grise*, and *various scenes* from Oriental life. M. Gérôme was decorated with the Prussian order of the Red Eagle and made a commander of the legion of honor. He died in 1904.

Gerona (hā-rō'nâ), a fortified town of N. E. Spain, capital of the province of Gerona, in Catalonia, at the confluence of the Oña and the Ter, 52 miles northeast of Barcelona. It consists of an old and a new town, the former on the slope of a hill, with antiquated houses and a stately cathedral. There are spinning and weaving; also paper factories. Gerona was once the residence of the Kings of Aragon, and as a place of strategic importance has sustained many memorable sieges. Pop. 15,787.—The PROVINCE, area 2270 square miles, abuts on the Mediterranean, is mountainous and mostly rugged, but with many fertile valleys, which produce olives, wine, wheat, rye, etc. Pop. 299,287.

Geronimo (jē-ron'i-mō), an Apache chief, noted in American frontier history. In 1884 and 1888, at the head of a band of hostile Indians, he was active in Arizona, committing many outrages on the white settlers. He surrendered to General Crook, in 1886, under an agreement that his band and their families should reside for two years in the East. But while negotiations were pending, he escaped with his followers to the mountains, where he remained until driven to exhaustion by General Miles. He and his associates were finally settled at Fort Sill, Okla.

Gerry (jer'ri), ELBRIDGE, statesman, born in Marblehead, Massachusetts, in 1744. He was a member of the Continental Congress; delegate to the Constitutional Convention; member of congress 1789–93; commissioner to France 1792–98; governor of Massachusetts 1810–12, and Vice President of the United States from March 4, 1813, till his death, November 23, 1814.

Gerrymander (ger'i-man-der), in American political history the name, first used in Massachusetts in 1812, given to an unfair political arrangement of electoral districts. It had its origin from a bill signed by Gov. Elbridge Gerry, which so apportioned a senatorial district in Republican interests that from its fantastic shape on the map it was said to resemble a salamander. Gerrymander was substituted for salamander, and the name persists to this day, although Governor Gerry was not responsible for the bill he signed.

Gers (zhār), a department in the S. W. of France, separated from the Bay of Biscay by the department of Landes; area 2425 square miles. The southern part is covered with ramifications of the Pyrenees separated by valleys, each of which is watered by its own stream. The chief of these are the Gers, Losse, Save, etc. More than half the land is under the plow, and about a seventh in vineyards. Much of the wine is made into Armagnac brandy. Auch is the capital. Pop. (1906) 231,088.

Gerson (zhār-sōn), JEAN DE, properly JEAN CHARLIER, a celebrated French theologian, born at Gerson in 1363. He was ardent and courageous in advocating improvements and reforms. When the Council of Constance (1414–18) in which he took a leading part, proved unable to settle the differences

existing in the church, he at last gave up the struggle in despair, and not daring to return to France, where his enemies had then the upper hand, sought shelter for a time in Bavaria and Austria. In 1419 he returned to his native country, and spent the last ten years of his life with his brother, the prior of a community of Celestine monks at Lyons, living an ascetic life, and devoting himself to religious meditation and the composition of theological and other treatises. The authorship of the *Imitation of Christ*, by Thomas à Kempis, was at one time erroneously ascribed to him.

Gerstäcker (ger-stek'ĕr), FRIEDRICH, a German traveler and novelist, born at Hamburg in 1816; died in 1872. In 1837 he came to America, where he earned a living by the most various employments—as a sailor, stoker, innkeeper, woodcutter, and trapper and hunter in the prairies of the west. He returned to Germany in 1843, and began his literary life by the publication of his experiences in America, *Streif- und Jagdzüge durch die Vereinigten Staaten Nordamerikas* (Dresden, 1844). This was followed by *Die Regulatoren in Arkansas; Die Flusspiraten des Mississippi; Mississippibilder*, etc. In 1849 Gerstäcker was engaged on behalf of the German government to collect information which might be useful to German emigrants. The results were published under the title of *Reisen* in 1853. He afterwards made voyages to South America, to Egypt, West Indies, and other places, which are described in his *Neue Reisen* (1868). Amongst his many romances (most of which may be had in English) are *Die beiden Sträflinge* (1856), *Im Busch* (1864), *General Franco* (1865), *Californische Skizzen* (1856), and others.

Gerund (jĕr'und), the name given originally to a part of the Latin verb which possesses the same power of government as a verb, but also resembles a noun in being governed by prepositions. In early English or Anglo-Saxon a dative form of the infinite is used to indicate purpose, and is often called the gerund. In modern English what seems to be a present participle governed by a preposition is sometimes denominated a gerund, in such phrases, for example, as 'fit for teaching'; but this is merely a verbal noun representing the old Anglo-Saxon noun ending in *-ung*.

Gervaise, or GERVASE (jer'vāz), a monk of Canterbury, born in 1150. Amongst his writings is an important chronicle, *Chronica de tempore regum Angliæ, Stephani, Henrici II et Ricardi I.* It is reprinted in Twysden's collection. Gervaise died probably about 1200.

Gervaise (or GERVASE), OF TILBURY, a chronicler of the twelfth and thirteenth centuries, born at Tilbury in Essex about the middle of the twelfth century. Having completed his studies in England, he visited the courts of Italy and of Germany, was appointed by Otto IV Marshal of the Kingdom of Arles. He died, according to some in 1218. His chief works are *Otia Imperialia* (containing a history of the kings of France and England); *Illustrationes Galfridi Monemuthensis* ('Illustrations of Geoffrey of Monmouth'); *Historia Terræ Sanctæ* ('History of the Holy Land'); *De Origine Burgundiorum* ('On the Origin of the Burgundians'). Most of his writings still remain in manuscript in the Cottonian collection and the Corpus Christi library, Cambridge.

Gervas (jer'vas), a small shrub, the *Stachytarpheta Jamaicensis*, nat. order Verbenaceæ, a native of the West Indies and warm parts of America, the leaves of which are sold in Austria under the name of Brazilian tea, and used in Britain to adulterate tea.

Gervinus (ger-vē'nus), GEORG GOTTFRIED, a German critic and historian, born at Darmstadt in 1805. He quitted commerce in 1825 to study at Heidelberg, was for some time a teacher, and qualified as a privatdocent. After a visit to Italy he published his *Geschichte der Poetischen Nationalliteratur der Deutschen* ('History of the Poetic National Literature of the Germans'). In 1835 he was appointed extraordinary professor at Heidelberg, and the following year ordinary professor of history and literature at Göttingen; but in 1837, being one of the seven professors who protested against King Ernst August's breach of the constitution, he was banished from Hanover. After another visit to Italy he returned to Heidelberg, where in 1844 he was appointed an honorary professor. He now began to take an active part in politics on the liberal side; became editor of the newly-founded *Deutsche Zeitung*, and was returned to the federal diet by the Hanse towns. Discontented with the tendency of affairs after 1848, he gave up politics and resumed his old studies. In 1849 he published the first of his great work on Shakespere, in 1853 his *History of German Poetry*, and in 1855 the first volume of his *History of the Nineteenth Century*, which, however, was never carried farther than the French revolution of 1830. Amongst his last writings was

a critical essay on *Handel and Shakespere*. He died in 1871.

Gesenius (ge-sē'ni-us), FRIEDRICH HEINRICH WILHELM, a German orientalist and Biblical critic, born in 1786, studied at Göttingen, and became professor of theology at Halle. In 1810-12 his *Hebrew and Chaldee Dictionary of the Old Testament* appeared. In 1820 he visited Paris and Oxford for the purpose of collecting materials regarding the Semitic languages. In 1829 he published his large *Thesaurus philologico-criticus Linguæ Hebraicæ et Chaldaicæ*, completed in 1858 by Rödiger. Besides the works mentioned, Gesenius wrote a *Hebrew Grammar*, a history of the Hebrew language, and notes to the German translation of Burckhardt's *Travels in Syria and Palestine*. He died in 1842.

Gesner (ges'nėr), ABRAHAM, geologist, born at Cornwallis, Nova Scotia, in 1797; died in 1864. He was appointed in 1838 to examine the geological resources of the lower provinces of Canada, and discovered how to produce oil for lamps from bituminous shale and cannel coal. To this oil he gave the name of 'kerosene.'

Gesner (ges'nėr), KONRAD VON, a German, born at Zürich in 1516, studied at Strasburg, Bourges, and Paris, and became schoolmaster in his native town. Hoping to raise himself from his needy condition, he went to Basel, and devoted himself particularly to the study of medicine. Afterwards he became successively professor of Greek at Lausanne, and of philosophy at Zürich. He did important work in the departments of history, zoology, and botany. His *Bibliotheca Universalis* is a descriptive catalogue of all writers extant in Greek, Latin, and Hebrew. His *Historia Animalium* must be regarded as the foundation of zoology; and in botany he was the inventor of the method of classifying the vegetable kingdom according to the characters of the seeds and flowers. He died of the plague at Zürich, 1565.

Gesneraceæ (ges-ner-ā'se-ē), an order of monopetalous exogens, typical genus *Gesnera*. There are many species, mostly natives of tropical and subtropical regions. They are shrubby herbs, often with tuberous rhizomes, and scarlet, violet, or blue flowers. Some of the genera are frequent in our hothouses, such as Gloxinia, Achimenes, Gesnera, etc.

Gessler. See *Tell*.

Gessner (ges'nėr), SALOMON, a German poet and artist, was born at Zürich in 1730; died there in 1787. In 1749 he was sent by his father to learn the business of bookselling at Berlin, but having taken a dislike to the business he maintained himself by executing landscapes. On his return to Zürich he published *Daphnis*, a small volume of idyls, and *Tod Abels* ('The Death of Abel'), a kind of pastoral idyl in prose. These idyls acquired for him a great reputation amongst contemporaries. For some years afterwards he devoted himself to the engraving art, in which he also became very eminent.

Gesta Romanorum (ges'ta rō-ma-nō'rum; 'Deeds of the Romans'), the usual title of a collection of short tales, legends, etc., in Latin, very popular during the middle ages. The book was probably written about the close of the thirteenth century by a certain monk Elinandus, an Englishman or a German. The separate tales making up the *Gesta* are of very various contents, and belong to different times and countries, the sources from which they are derived being partly classical, partly oriental, and partly western. Whatever may have been the intention of the original compiler, they very soon were adapted to the moralizing tendencies of the time, and moral reflections and allegorical interpretations were added to them, it is said, by a Petrus Bercorius or Pierre Bercaire of Poitou, a Benedictine prior. After the Reformation the book fell into oblivion.

Gestation (jes-tā'shun; Latin, *gestare*, to bear), in physiology, the name given to the interval which elapses between the impregnation of any of the mammalia and the period of birth. This period varies from 25 days, in the case of the mouse, to 620, in that of the elephant.

Geste, CHANSONS DE. See *France—Literature*.

Getæ (ge'tē), an ancient people of Europe, dwelling at first in Thrace; afterwards a part of them moved west on the north bank of the Danube, where they were known to the Romans as the Daci. (See *Dacia*.) Another portion moved east into Asia.

Gethsemane (geth-sem'a-nē: 'oil-press'), an olive garden or orchard in the neighborhood of Jerusalem, memorable as the scene of the last sufferings of our Lord. The traditionary site of this garden places it on the east side of the city, a very little beyond the Kedron, near the base of Mt. Olivet. It contains some very old olive-trees, piously regarded as having stood there in the time of our Lord.

Gettysburg (get'tis-burg), a city, the capital of Adams County, Pennsylvania. Here are the Pennsylvanian College (Lutheran), founded in 1832; the national cemetery for Union soldiers, and a national homestead for the orphans of Union soldiers. At Gettysburg a battle was fought (July 1, 2 and 3, 1863) between the Union forces under General Meade and the Confederate forces under General Lee, in which the latter suffered defeat. This great battle was the turning point in the Civil war, the critical event in the great struggle of the North and South, and in consequence the battlefield has been converted into a national park, adorned with numerous monuments erected by the regiments engaged. To these, in 1910, the State of Pennsylvania added a noble monument, on which are inscribed the names of all Pennsylvanians who took part in the battle. Pop. 4030.

Geum (jē'um), a genus of hardy herbaceous perennials, belonging to the nat. order Rosaceæ, chiefly natives of the northern parts of the world. *G. Canadense*, chocolate-root, or bloodroot, a North American species, has some reputation as a tonic. A species of saxifrage is also called *Geum*.

Geyser (gī'zer), a slight alteration of the Icelandic name *geysir*, from *geysa*, to gush or rush forth, and applied to natural springs of hot water of the kind that were first observed in Iceland. The geysers of Iceland, about a hundred in number, lie about 30 miles N. W. of Mount Hecla, in a plain covered by hot springs and steaming apertures. The two most remarkable are the Great Geyser and the New Geyser or Strokkur (churn), the former of which throws up at times a column of hot water to the height of from 80 to 200 feet. The basin of the Great Geyser is about 70 feet across at its greatest diameter. The New Geyser, which is only 100 yards distant, is much inferior in size. The springs are supposed to be connected with Mount Hecla, and the phenomenon of eruption has been explained by Tyndall as due to the heating of the walls of a fissure, whereby the water is slowly raised to the boiling point under pressure, and explodes into steam, an interval being required for the process to be repeated. The geysers of Iceland, however, have been surpassed by those discovered in the Rocky Mountains in the Yellowstone region of the State of Wyoming, the largest of which throw up jets of water from 90 to 250 feet high. (See *Yellowstone*.) The hot-lake district of Auckland, New Zealand, is also famous in possessing some of the most remarkable geyser scenery in the world. These phenomena are of three kinds; the puias (fire-springs), geysers continually or intermittently active; mgawhas or inactive puias, which emit steam, but do not throw up columns of water; and waiariki or hot-water cisterns. This region formerly was remarkable for the number of natural terraces containing hot waterpools or cisterns, and its lakes all filled at intervals by the boiling geysers and thermal springs, but the configuration of the country was considerably altered by a disastrous volcanic outbreak in 1886, its beautiful pink and white terraces being destroyed. Ngah apu or Ohopia, a circular rocky basin, 40 feet in diameter, in which a violent geyser is constantly boiling up to the height of 10 or 12 feet, emitting dense clouds of steam, is one of the natural wonders of the southern hemisphere, and is much visited by tourists traveling through New Zealand.

Ghadames (ghâ-dā'mes), a town of North Africa, in the southwest of Tripoli. It is about 310 miles S. W. of the town of Tripoli, is situated in the midst of an oasis, and is the center of caravan routes to Tunis, Tripoli, etc. Figs, dates, barley, wheat, etc., are grown in the gardens, which are watered by a hot-spring. Pop. about 7000.

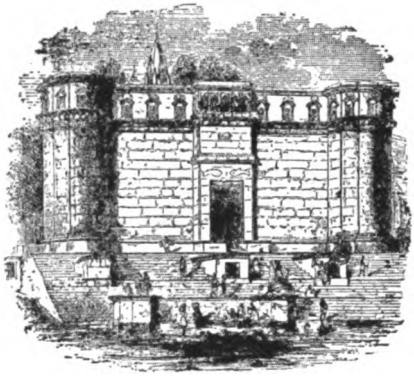
Ghagra, or GHOGRA. See *Gogra*.

Ghara, or GARRA (gär'râ), a river in the Punjab, being the name by which the united streams of the Bias and Sutlej are known, from their confluence at Endrisa to the junction with the Chenab, after which the united waters flow under the name of the Punjnad to the Indus. The Ghara is about 300 miles long.

Ghâts (gâts), or GHAUTS, EASTERN and WESTERN, two ranges of mountains in the peninsular portion of Hindustan, the former running down the east side of India, but leaving broad tracts between their base and the coast; the latter running down the west side, but leaving only a narrow strip between them and the shore. Both meet near Cape Comorin. The general elevation of the Western Ghâts varies from 4000 to 7000 feet. Its best known portion is the Neilgherries, with Dodabetta Peak, their highest point 8760 feet above the sea. The Western Ghâts form a watershed, and the rain collected on its eastern slopes makes its way right across India to the Bay of Bengal. They are covered with fine forests, and have most picturesque scenery. The Eastern Ghâts are of

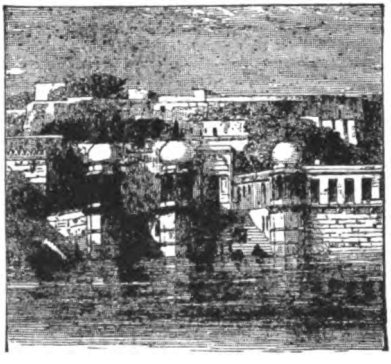
considerably less elevation, on the average about 1500 feet, and have none of the beauty of the western range. They are, however, rich in metals.

Ghâts (gäts), or GHAUTS, a Hindu term employed to designate landing-stairs on a river, especially when



Ghoosla Ghât, Benares.

large and substantially constructed. These ghâts are very numerous on the Ganges, and are great places of resort by the people of the towns where they



Bathing Ghâts on the River Jumna at Muttra.

are situated. Some of them are noteworthy from an architectural point of view, having temples, bathing-houses, etc., at the top.

Ghazipur (gä-zē-pör'), a town in Hindustan, headquarters of the Ghazipur District, Northwestern Provinces, about 44 miles northeast of the town of Benares. It stretches along the banks of the Ganges; has a trade in sugar, tobacco, rose-water, and otto of roses; and is a healthy place. The ruins of the Palace of the Forty Pillars, and a monument to Lord Cornwallis, who died here in 1805, are here. Pop. 39,429. The district, one of the hottest and dampest in the N. W., has an area of 1473 sq. miles.

Ghazni (gäz'nē), GHUZNEE, or GHIZNI, an ancient and celebrated city and fortress in Afghanistan, 84 miles S. S. W. of Cabul, on an eminence 7726 feet above sea-level. The wall embraces the whole of the hill; the houses are of mud; the streets, dark, narrow, and irregular. The country round Ghazna is very productive in grain, fruits, tobacco, etc. Three miles northeast are the ruins of the ancient city, which under the celebrated Sultan Mahmud (999-1030) (see *Ghaznavides*), was the capital of a great empire. It has been twice taken by British forces (1839 and 1842). Pop. est. about 10,000.

Ghaznavides (gäz'-na-vīdz), a dynasty founded in 961 by Alepteghin, originally a slave belonging to the Ameer of Bokhara. Ghazna was the seat of his power, and became, under his successors, the capital of an empire which reached from the Tigris to the Ganges, and from the Sihon to the Indian Ocean. The most brilliant period of the dynasty was that of Sultan Mahmud (999-1030). It became extinct towards the end of the twelfth century after having lost most of its possessions.

Ghebers (gē'bėrz). See *Guebres*.

Ghee (gē), or GHI, a peculiar kind of butter in use among the Hindus. It is made from the milk of the buffalo or the cow. The milk is boiled for an hour or so, and cooled, after which a little curdled milk is added. Next morning the curdled mass is churned for half an hour; some hot water is then added, and the churning continued for another half-hour, when the butter forms. When after a few days it becomes rancid, it is boiled till all the water is expelled, and a little more curdled milk added with some salt or betel-leaves, after which it is put into pots. In this state it will keep for a long time. It is too strong for European taste, but is a favorite article of consumption amongst rich Hindus.

Gheel (gāl), a village and commune in Belgium, 26 miles E. S. E. of the town of Antwerp and in the province of that name. It is situated in a fertile spot in the midst of a sandy waste, and is inhabited by a class of peasant farm-

ers. It has manufactures of cloth, hats, wax and tallow candles, etc.; tanneries, dyeworks, ropeworks, etc., and a considerable trade in butter. The commune has been long remarkable for containing a colony of deranged persons, numbering at present about 1600, who are lodged and boarded in the houses of the country people, who make use of their services, when available, in field and other labor. Little or no restraint is employed, and the best effects thence ensue. Lately a hospital has been erected, with a medical staff, for the supervision of the relations between the insane and their custodiers. Patients are sent hither from all parts of Belgium. Pop. 14,087.

Ghent (gent; French, *Gand;* Flemish, *Gend* or *Gent*), a town in Belgium, capital of the province of East Flanders, in a fertile plain at the confluence of the Lys with the Scheldt. It is upwards of 6 miles in circumference, and is divided by canals into a number of islands connected with each other by bridges. Except in some of the older parts it is well built, and has a number of fine promenades and many notable buildings. Amongst the latter are the cathedral of St. Bavon, a vast and richly-decorated structure, dating from the thirteenth century; the church of St. Nicholas, the oldest in Ghent; the church of St. Michael, with a celebrated *Crucifixion* by Vandyk; the university, a handsome modern structure, with a library of about 100,000 volumes and 700 MSS.; the Hôtel-de-Ville; the Belfry, a lofty square tower surmounted by a gilded dragon, and containing a fine set of chimes consisting of forty-four bells, one of which is the famous 'Roland of Ghent'; the new Palais de Justice; the Marché du Vendredi, an extensive square, interesting as the scene of many important historical events; and Les Béguinages, extensive nunneries founded in the thirteenth century, the principal occupation of whose members is lacemaking. Ghent has long been celebrated as a manufacturing town, especially for its cotton and linen goods and lace. Other industries of importance are sugar-refining, hosiery, thread, ribbons, instruments in steel, carriages, paper, hats, delftware, tobacco, etc. There are also machine-works, engine-factories, roperies, tanneries, breweries, and distilleries. The trade is very important. A canal 16 feet deep and 11 yards wide, connects it with the Scheldt at Terneuzen, but is less used than it might be on account of the heavy imposts levied by Holland on vessels passing through. Another canal connects the Lys with the canal from Bruges to Ostend. A new dock, capable of holding 400 vessels, was opened in 1881. Population, 162,482. It is mentioned as a town in the seventh century. In the ninth century Baldwin, the first count of Flanders, built a fortress here against the Normans. Under the counts of Flanders Ghent continued to increase, and in the fourteenth century could send 50,000 men into the field. The wealth and liberty of its citizens disposed them to a bold maintenance of their privileges against the encroachments of feudal lords like the Dukes of Burgundy and the Kings of Spain. In 1792 the Netherlands fell under the power of France, and Ghent became the capital of the department of Essaut (Scheldt). In 1814 it became, along with Flanders, part of the Netherlands, till the separation of Belgium and Holland. See *Belgium.*

Ghent, TREATY OF, the treaty which brought to a close the war between the United States and Great Britain, 1812-14. It was negotiated at Ghent, Belgium, by representatives of the two countries, and was signed on December 24, 1814. Although the United States had gone to war primarily because Great Britain had impressed American seamen and hampered American commerce, no mention was made of either in the treaty. As ratified it declared for 'firm and universal peace' and stipulated that all territory (with the exception of the Passamaquoddy islands), taken during the war should be returned.

Gherardesca (gā-rär-des'kä), a family of Tuscan origin which plays an important part in the history of the Italian republics of the middle ages. Historically the most prominent member of the family is Ugolino, whose death, and that of his two sons and grandsons, by starvation in the 'Tower of Hunger,' is described in one of the celebrated passages of Dante's *Divina Commedia.*

Ghetto (get'to), the name frequently applied to the Jewish quarter of large cities.

Ghibellines (gib'el-lĭnz), the name of a political party in Italy, which, in general, favored the claims of the emperor against those of the pope. The name is said to be derived from Waiblingen, a small estate belonging to the Hohenstaufen princes. See *Guelfs and Ghibellines.*

Ghiberti (gē-ber'tē), LORENZO, an Italian statuary, born about 1378 at Florence; died about 1455. He early learned from his stepfather, Bartaluccio, an expert goldsmith, the arts of drawing and modeling, and that of

casting metals. He was engaged in painting frescoes at Rimini, in the palace of Pandolfo Malatesta, when the priori of the society of merchants at Florence invited artists to propose models for one of the bronze doors of the baptistry of San Giovanni. The judges selected the works of Donatello and Ghiberti as the best (according to Vasari, also that of Brunelleschi, who is not mentioned by Ghiberti himself as one of the competitors); but the former voluntarily withdrew his claims, giving the preference to Ghiberti. After twenty-one years' labor Ghiberti completed the door, and, at the request of the priori, executed a second, after almost as long a period. Michael Angelo said of these, that they were worthy of adorning the entrance to paradise. During these forty years Ghiberti also completed other works, bas-reliefs, statues, and some excellent paintings on glass, most of which may be seen in the cathedral and the church of Or San Michele at Florence.

Ghika (gē'ka), HELENA, PRINCESS KOLTZOFF-MASSALSKY, better known by the pseudonym of Dora d'Istria, a writer of travels, historical studies, and novels. She was the daughter of Prince Michael Ghika, and niece of Gregory Ghika X, hospodar of Wallachia, and was born at Bukarest in 1828. She was carefully educated, and acquired by frequent travels an extensive knowledge of modern languages and literature. In 1849 she was married to Prince Koltzoff-Massalsky. Her first important work, *La Vie Monastique dans l'Eglise Orientale*, was published at Paris in 1855. *La Suisse Allemande, Les Femmes en Orient, Des Femmes par une Femme*, represent social and political studies on modern civilization. In *Au bord des Lacs Helvétiques* (1864) she collected a number of stories written for the *Revue des Deux Mondes*. Amongst her other works are *Eli Albanesi in Rumenia;* and *La Poésie des Ottomans* (1877). She also won distinction as a landscape painter. She died in 1888.

Ghilan (gi-lân'), a province of Persia, on the southwest shore of the Caspian Sea; area, about 4250 square miles. The lofty range of the Elburz Mountains forms its southern boundary. The whole province, except where cleared for cultivation and on the mountain summits, is covered with woods, and the excessive rain and dense vegetation render much of the level country a morass. The climate is consequently unhealthy. The province is rich in metals and very fertile. The capital is Resht. Pop. about 250,000.

Ghirlandaio (gēr-län-dä'yō), or CORRADI DOMENICO, one of the older Florentine painters, born at Florence in 1450; died 1495. He was the son of a goldsmith known as Il Ghirlandaio (the garland-maker), from his skill in making garlands. He was distinguished by fertility of invention, a more natural rendering of life, and a more accurate perspective than his predecessors. Amongst his best works are the frescoes in the Sassetti Chapel of the Trinity Church and in the choir of Santa Maria Novella at Florence, and the pictures in the Uffizi and the academy at Florence. Michael Angelo was one of his pupils.

Ghizeh. See *Gizeh.*

Ghiznevides. See *Ghaznavides.*

Ghizni. See *Ghasni.*

Ghoorkas. See *Goorkhas.*

Ghost Dance, a religious ceremony of the Piute Indians of Nevada, originating about 1889, so-called from the fact that the dancers wore a white shirt over their ordinary dress. It arose from a belief that a Messiah was soon to appear who would drive the white men from the land. It took place at night, the dancers singing the ghost songs, chants in the form of messages from their spirit friends. It quickly spread to other tribes, and led indirectly to the Sioux outbreak of 1890-91.

Ghost-moth, a nocturnal lepidopterous insect (*Hepialus humuli*), so called from the male being of a white color, and from its habit of hovering with a pendulum-like motion in the twilight over one spot (often in churchyards), where the female, which has gray posterior wings and red-spotted anterior wings, is concealed.

Ghur, or GHOR (gŏr), a mountainous district of Afghanistan, between Herat and Candahar, peopled by Mongol tribes who are practically independent. It was the original seat of the second Mohammedan dynasty in Hindustan, the princes of Ghur, who, in the eleventh and twelfth centuries, included in their kingdom of Ghur, Afghanistan, Lahore, Sind, and Khorasan.

Ghuznee. See *Ghazni.*

Giallo Antico (jäl'ō ăn-tē'kō), the Italian name of a kind of fine yellow marble, used in ancient Roman architecture and obtained from Numidia.

Gianibelli or GIAMBELLI (jän-i-bel'lē, (jäm-bel'lē), FEDERIGO, an Italian military engineer, born at Mantua about 1530. After having offered his services to Philip II of Spain without much result, he went to England, where Elizabeth gave him a pension and sent him to help the Netherlanders in their defense of Antwerp against the Spaniards (1585). Here he made himself famous by the damage which his inventions did to the enemy. After this he returned to England, where he fortified the coast-line against the Spanish invasion, and suggested the use of fireships, which were so disastrous to the Armada.

Giannone (jän-ō'nā), PIETRO, an Italian author equally celebrated by his fate and by his writings, born in 1676. He studied law in Naples, and after winning a high place as an advocate retired to give himself up to the execution of his great work, the *Civil History of the Kingdom of Naples* (1723). The severity with which Giannone treated the church, and the attacks which he made on the temporal power of the popes, drew upon him the persecutions of the court of Rome, and of the clergy in general. The offensive publication was burned, and the author excommunicated. Giannone therefore quitted Naples, 1723, and took refuge in Vienna, where, for a time, he was protected by the influence of powerful friends, but had ultimately to leave and betake himself to Venice in 1734. Expelled from Venice by the suspicious republic, he finally took refuge in Geneva. Here he wrote his *Triregno*, a bitter attack on the papal pretensions. In 1736, having been enticed by a government emissary to enter the Sardinian States, he was seized and imprisoned in the citadel of Turin, where he died in 1748.

Giant Powder, a name in America for dynamite.

Giants (jī'antz), people of extraordinary stature. History, both sacred and profane, makes mention of giants, and even of races of giants, but this in general occurs only at that early stage of civilization when the national mind is apt to exaggerate anything unusual. Hence the Cyclopes and Læstrygones of the ancients and the Cornish and Welsh giants of English folk-lore. The first mention of giants in the Bible is in Gen., vi. 4, where the Hebrew word used is *nephilim*, a word which occurs in only one other passage, where it is applied to the sons of Anak, who dwelt about Hebron, and who were described by the terrified spies as of such size that compared with them they appeared in their own sight as grasshoppers. A race of giants called the Rephaim is frequently mentioned in the Bible, and in Gen., xiv, and xv, appear as a distinct tribe, of whom Og, king of Bashan, is said to have been the last. Other races of giants are mentioned, such as the Emim, the Zuzim, and the Zamzummim. The giants of old Greek or of Norse mythology have, of course, merely a symbolic existence, representing benignant or adverse forces of nature on which man might count in his struggle to reduce the world around him into some kind of order. The tales of old writers regarding gigantic human skeletons have now no importance, it being mostly certain that these bones do not belong to giants, but to animals of the primitive world which, from ignorance of anatomy, were taken for human bones. The ordinary height of men is between 5 and 6 feet; amongst the Patagonians of South America, however, the average seems to be considerably higher, though not so high as to entitle them to be considered a race of giants. Notable deviations from this medium height are not at all uncommon, especially among the Teutonic peoples. The following are amongst authentic instances, ancient and modern, of persons who attained to the stature of giants: The Roman Emperor Maximin, a Thracian, nearly 9 feet high; Queen Elizabeth's Flemish porter, 7 feet 6 inches; C. Munster, a yeoman of the guard in Hanover, who died in 1676, 8 feet 6 inches high; Cajanus, a Swedish giant, about 9 feet high, exhibited in London in 1742; C. Byrne, who died in 1783, attained the height of 8 feet 4 inches; Patrick Cotter O'Brien, who lived about the same time, was 8 feet 7¾ inches; a Swede in the celebrated grenadier guard of Frederick William I of Prussia stood 8½ feet. In 1844 died Pauline Wedde (called Marian), over 8 feet 2 inches at the age of eighteen. One of the highest on record is the Austrian giant Josef Winkelmaier (1865-1887), whose height was 8 feet 9 inches. As a rule, giants are comparatively feeble in body and mind, and are short-lived. Gigantic stature is generally accompanied by a want of proportion in parts, some parts growing too quickly for others, or continuing to grow after the others have ceased. The relation between the upper and lower half of the body is not disturbed; but the skull, brain, and forehead are relatively small, the jaws very large, the shoulders, breast, and haunches very broad, and the muscular system comparatively weak. Some giants are affected with the disease called acromegaly, an ailment of the pos-

terior half of the pituitary body, a small, ductless gland situated at the base of the brain, in the sella turcica, a saddle-shaped space in the sphenoid bone. In these the hands, head, and feet are especially enlarged.

Giant's Causeway (jī'antz kąz'wā), an extensive and extraordinary assemblage of polygonal basaltic columns on the north coast of Ireland, in the County of Antrim, between Bengore Head and Port Rush. The name is sometimes given to the whole range of basalt cliffs along the coast, some of which reach the height of 400 or 500 feet; but it is more properly restricted to a small portion of it where a platform of closely-arranged basalt columns from 15 to 36 feet in height runs down into the sea in three divisions, known as the Little, the Middle, and the Grand Causeway. The last is from 20 to 30 feet wide, and stretches some 900 feet into the sea. The Giant's Causeway derives its name from the legend that it was built by giants as a road which was to stretch across the sea to Scotland. There are similar formations on the west coast of Scotland, on the island of Staffa.

Giant's Kettles, a name given in Norway to vertical, pot-shaped, smooth hollows excavated in rocks, usually filled up with stones, gravel, etc. They were probably formed by water from the ice of the glacial period, descending through *moulins* or glacial chimneys and setting stones and boulders in rapid rotation. The pot-holes found in the beds of rapid streams and near waterfalls had a similar origin.

Giaour (jour), a Turkish word from Persian *gawr*, an infidel, used by the Turks to designate the adherents of all religions except Mohammedan, more particularly Christians. The use of it is so common that it is often applied without intending an insult.

Giarre (ji-ăr'rā), a Sicilian town near the coast, in the province of Catania. In the neighborhood are what is left of the famous chestnut trees of Ætna. Pop. 26,194.

Gibbon (gib'un), a name common to the apes of the genus *Hylobătes*, but more particularly restricted to the species *Hylobătes lar*, which inhabits the islands of the Indian Archipelago. It is distinguished from other quadrumanous animals by the slenderness of its form, but more particularly by the extraordinary length of its arms, which, when the animal is standing, reach nearly to the ankles, and which enables it to swing itself from tree to tree with wonderful agility. Its color is black, but its face is commonly surrounded with a white or gray beard. There are various other species, and the gibbons are classed among the anthropoid apes, and can stand erect with more ease than the orang or gorilla, their long arms aiding them to maintain the erect attitude, though they cannot walk with ease.

Gibbon, EDWARD, an eminent English historian, was born at Putney in Surrey in 1737. He was the son of a gentleman of an ancient Kentish family. He entered Magdalen College, Oxford, where he remained fourteen months. Having declared himself a Roman Catholic, his father placed him under the care of M. Pavillard, a learned Calvinistic minister at Lausanne, by whom he was reconverted to the Protestant faith. His residence at Lausanne was highly favorable to his progress in knowledge and the formation of regular habits of study. The belles-lettres and the history of the human mind chiefly occupied his attention. In 1758 he returned to England, and immediately began to lay the foundation of a copious library; and soon after composed in the French language his *Essai sur l'Etude de la Littérature* (1761). In 1763 he visited Paris and Lausanne, and he journeyed in Italy during 1764. It was here that the idea of writing his great history occurred to him as he sat musing among the ruins of the capitol at Rome, while the barefooted friars were singing vespers in the Temple of Jupiter. In 1770 he published a pamphlet entitled *Critical Observations on the Sixth Book of the Æneid.* In 1774 he obtained a seat in Parliament for Liskeard, and was a silent supporter of the North administration and its American politics for eight years. In 1776 the first quarto volume of his *Decline and Fall of the Roman Empire* was published, and at once made a public reputation for its author. In 1778 he drew up on behalf of the English government a *Mémoire Justificatif* in answer to the manifesto of the French court, and for this service he was made one of the lords of trade. On the retirement of North he lost his appointment, and soon after withdrew to Lausanne (1783), where, in the course of four years, he completed the three remaining volumes of his history, which were published together in 1788. In 1793 he returned to England, where he died in 1794.

Gibbon, JOHN, soldier, born in Pennsylvania in 1826. He graduated at West Point in 1847, became captain in 1859; took part in the Civil war, commanding a brigade at Antietam and

Gettysburg, and serving as major-general in Grant's Wilderness-Richmond campaign. He was breveted major-general in the regular army in 1865, promoted brigadier-general in 1886, retired in 1891, and died in 1896.

Gibbons, JAMES, a cardinal of the Roman Catholic Church, was born at Baltimore in 1834. He was ordained a priest in 1861; made bishop of North Carolina in 1868, and of Richmond in 1872; archbishop of Baltimore in 1877, and created cardinal in 1886. As an author he is best known by *The Faith of Our Fathers.*

Gibbons, ORLANDO, an English musical composer, born in 1583; died in 1625. At the age of twenty-one he was appointed organist of the Chapel Royal, and in 1622 he received the degree of Doctor of Music from the University of Oxford. Three years later he died of smallpox at Canterbury, where he had gone to be present at the marriage of Charles I with Henrietta of France. He was buried in Canterbury Cathedral, where his wife caused a magnificent tomb to be erected to him. He is the author of *Madrigals and Anthems* ('Hosanna to the Son of David!' 'Almighty and Everlasting God!' etc.).

Gibbs, OLIVER WOLCOTT, chemist, born in New York city in 1822. He was professor of physics and chemistry in the College of the City of New York 1849-63, and Remford professor in Harvard University 1863-87. His chemical researches were of great value, and he was for many years one of the editors of *The American Journal of Science and Arts.* He was one of the original members of the National Academy of Sciences.

Gibel (jib'el), a fish of the carp genus, *Cyprinus gibelio*, generally known in England as the Prussian carp, and belonging to that section of the genus having no barbules at the mouth. It is a good table fish, but seldom weighs more than ½ lb. It is said to be able to live so much as thirty hours out of water.

Gibeon (ghib'e-on), one of the ancient royal cities of the Canaanites, a 'great city' of the Hivites, who at an early stage of Joshua's conquests, by disguising themselves in old clothes and professing to come from a far country, obtained an alliance and covenant with the Israelites. When the stratagem was discovered, the Israelites resolved to observe the covenant, but condemned them to be 'hewers of wood and drawers of water unto all the congregation' (Jos., ix, 21). It was during the battle here between Joshua and the five kings of the Amorites that the sun 'stood still upon Gibeon, and the moon in the valley of Ajalon.' Gibeon has been identified with the modern El-Jib.

Gibraltar (jib-ral'tar), a town and strongly-fortified rocky peninsula near the southern extremity of Spain, a military stronghold of Great Britain. It is connected with the mainland by a low, sandy isthmus, 1½ miles long and ¾ mile broad, known as the 'neutral ground,' and has Gibraltar Bay on the west, the open sea on the east and south. The highest point of the rock is about 1400 feet above sea-level; its north face is almost perpendicular, while its east side exhibits tremendous precipices. On its south side it is almost inaccessible, making approach from seaward impossible; the west side, again, although very rugged and precipitous, slopes towards the sea; and here the rock is secured by extensive and powerful batteries, rendering it apparently impregnable. Vast sums of money and an immense amount of labor have been spent in fortifying this celebrated stronghold, which, as a coaling station, depôt for war material, and a port of refuge in case of war, would form one of the most important points of support for British naval operations and British commerce eastwards. Numerous caverns and galleries, extending 2 to 3 miles in length, and of sufficient width for carriages, have been cut in the solid rock, with port-holes at intervals of every 12 yards bearing upon the neutral ground and the bay, and mounted with more than 1000 guns, some of them of the largest size. The garrison numbers about 5000. The town of Gibraltar is situated on the west side of the peninsula, terminating in Europa Point, and thus fronts the bay. It consists chiefly of one spacious street about ½ mile in length, lined with shops, and paved and lighted. Its water supply is derived from the rainfall. Gibraltar is a free port, and has a considerable shipping trade, being an entrepôt for the distribution of British manufactures. The chief export is wine. The civil population amounts to about 22,000.—Gibraltar, known to the Greeks as Calpe, was first fortified as a strategic point by the Saracen leader Tarik Ibn Zeiad in 711-12, from whom it was thenceforward called Gebel-al-Tarik, the rock of Tarik. It was ultimately taken by the Spaniards from the Moors in 1462, fortified in the European style, and so much strengthened that the engineers of the seventeenth century considered it impregnable. It was taken, however, after a vigorous bombardment in 1704

by a combined English and Dutch force under Sir George Rooke and Prince George of Darmstadt, and was secured to Britain by the Peace of Utrecht in 1713. Since then it has remained in British hands, notwithstanding some desperate efforts on the part of Spain and France to retake it. In 1704-5 it was closely besieged; in 1727 it was hard pressed by a Spanish force when Admiral Wager, with eleven ships of the line, relieved it. In 1779, Britain being then engaged in a war with its revolted colonies and with France, a last grand effort was made by Spain to recover Gibraltar. The siege lasted for nearly four years, the fire being for the great part of that time very harassing, and rising on several occasions into a fierce and prolonged bombardment. It was heroically and successfully defended, however, by General Elliot (afterwards Lord Heathfield) and the garrison. Since that time, in the various British and Spanish, and also French wars, Gibraltar has only been blockaded on the land side.

Gibraltar, STRAITS OF, the channel which forms an entrance from the Atlantic into the Mediterranean. The narrowest part is a little to the west of Gibraltar, and 15 miles across. A strong and constant current flows into the Mediterranean from the Atlantic Ocean, in the middle of the Straits, but the undercurrent as well as two feeble lateral currents along the coast set towards the ocean.

Gibson (gib'son), CHARLES DANA, artist, born at Roxbury, Massachusetts, in 1867. He studied art in New York and Paris, and became a successful instructor and society cartoonist in New York. The 'Gibson girl' an American type, was created by him. He wrote *People of Dickens, Sketches and Cartoons, A Widow and her Friends, The Social Ladder*, etc.

Gibson, JOHN, one of the most distinguished English sculptors of modern times, born near Conway, in Wales, in 1790; died at Rome in 1866. He was the son of a landscape-gardener, and was apprenticed to a woodcarver at Liverpool, where he attracted attention by a figure of *Time* modeled in wax which he exhibited at the age of eighteen. The patronage of Mr. W. Roscoe assisted him to go to Rome, where he was cordially received by Canova. On the death of Canova in 1822, Gibson entered the studio of Thorwaldsen. His reputation was now widely spread, and his works were eagerly sought after by his countrymen. In 1836 he was made a Royal Academician; but to the end of his life he continued to make Rome his chief place of residence. Most of Gibson's subjects are taken from classical mythology, and are executed with a noble severity and purity of style. Among his best works are: *The Wounded Amazon; The Hunter and His Dog; Hylas and the Nymphs, Helen, Proserpine, Sappho*, and others. One of his peculiarities as an artist was the practice of coloring his statues.

Giddings (gid'ings), FRANKLIN HENRY, sociologist, born at Sherman, Connecticut, in 1855. He engaged in journalism and afterwards became a professor of and lecturer in sociology. Has held this chair in Columbia University since 1894. He wrote *The Theory of Sociology, The Principles of Sociology*, and other works on this subject.

Giddings, JOSHUA REED, statesman, was born at Athens, Pennsylvania, 1795; died in 1864. Successfully practicing as a lawyer, in 1839, he was elected to congress, serving for twenty years. An advocate of the abolition of slavery in the territories, he seized every opportunity to aid in the formation of a public sentiment hostile to its further extension. His life was often threatened, and twice he was assaulted by armed men on the floor of the House, and once mobbed in Washington. For antislavery resolutions introduced by him he was censured by vote of the House. He was a forcible speaker and able writer.

Giers (gērz), NICHOLAS CARLOVITCH DE, a Russian statesman descended from a Swedish family settled in Finland, was born in 1820. After holding various posts, in 1875 he became adjunct to Prince Gortschakoff, the minister of foreign affairs, whom he succeeded in 1882. His policy in general was understood to be of peaceful tendencies, and in particular opposed to Panslavistic ideas of development. In Central Asia, however, he continued the policy of advance, and in 1885 the Russian occupation of positions within the Afghan frontier nearly brought about a war with Britain. He died in 1895.

Giessen (gē'sĕn), a town of Germany, capital of the province of Upper Hesse, in the Grand-duchy of Hesse-Darmstadt, on the Lahn. It was once fortified, and is still entered by four gates, but its ramparts have been converted into pleasant walks. It has a castle, now converted into government offices, and a university founded in 1607, and possessing valuable apparatus, an observatory, and a botanical garden. Pop. 31,153.

Gifford (gif'ord), ROBERT SWAIN, artist, born at Goswald, Massachusetts, in 1840, the son of a poor boatman. He traveled extensively in the interest of art and became one of the leading American landscape painters, and was also distinguished as an etcher and art instructor. He died in 1905.

Gifford, SANDFORD ROBINSON, painter, born at Greenfield, New York, in 1823; died in 1880. He developed a versatile talent as an artist, his main attention being given to landscapes. Among his noted works are *Coming Storm, Waves Breaking on the Beach,* and *Morning in the Mountains.*

Gifford, WILLIAM, a critic and satirist, born at Ashburton, Devonshire, in 1757. He was apprenticed to a shoemaker, but possessing a strong taste for study he was enabled by the kindness of some friends to go to school and afterwards to Oxford University. After being some time tutor in Earl Grosvenor's family he published in 1794, *The Bæviad,* a satire directed against the poetasters of the Della Crusca school; and in 1795 *The Mæviad,* a severe satire on the contemporary drama. In 1797 he became editor of the *Anti-Jacobin;* and he published a translation of Juvenal in 1802. On the foundation of the *Quarterly Review in* 1809, he became its editor, conducting it with much ability. He also edited the works of Massinger, Ford, Jonson, and Shirley. He died in 1826, and was interred in Westminster Abbey.

Gifford Lectures, lectureships endowed by Lord Gifford, one of the judges of the Court of Session, Edinburgh, from 1870 to 1881, who left £80,000 for the purpose. They were founded in connection with the Universities of Edinburgh, Glasgow, Aberdeen, and St. Andrews, and are for the exposition of natural religion in the widest sense of that term; the lecturers to be subjected to no test of any kind; to belong to any denomination whatever, or to no denomination. The appointments are for two years, but may be held for six. The lecturers were to deliver a yearly course of about twenty original lectures open to all. The first lecturers were: Glasgow, Max Müller; Edinburgh, Hutchinson Stirling; St. Andrews, Andrew Lang; and Aberdeen, E. B. Tylor.

Gijon (*hē-hōn'*), a seaport in Spain, on the Bay of Biscay. It consists of an old and a new town, the former on the upper part of a slope and the latter below. It contains a cigar manufactory, employing about 1400 persons, and has various other industries and a good trade. Pop. 52,226.

Gila (jē'lä), RIO, a North American river, which rises in New Mexico and flows westward for 450 miles, and then unites with the Colorado. Curious ruins of stone-built houses occur all along its banks. In these are found fragments of pottery.

Gila Monster (*Heloderma suspectum*), a poisonous lizard of the desert region of the Southwest United States. It is one of the largest lizards of the continent, and has scales of brilliant orange and jet black. Its bite is fatal to small mammals and birds and very injurious to man, though seldom fatal. *H. horridum,* of Mexico, is similarly poisonous.

Gilbert (gil'bert), SIR HUMPHREY, an English navigator of the reign of Queen Elizabeth, born in Devonshire about 1539. In 1578 he obtained from the queen a patent, empowering him to discover and colonize in North America any land then unsettled, and made an unsuccessful voyage to Newfoundland. In 1583 he sailed to it again, and took possession of the harbor of St. John's. On his return home he embarked in a small vessel and was lost in a storm.

Gilbert, SIR JOHN, an English painter, born in 1817. He first exhibited in 1836. His first notable work was *The Arrest of Lord Hastings by the Protector Richard, Duke of Gloucester,* in water-color. He has also painted in oil, and among his more notable productions in that branch of the art are *Don Quixote giving Advice to Sancho Panza, The Education of Gil Blas.* and a series of tableaux of the principal character in Shakespere. He possessed especial merit in depicting old English scenes. He was the most prominent artist engaged on the *Illustrated London News* for a number of years after its commencement in 1842, and during the same period did a great amount of book illustration. In 1871 he became president of the Society of Water-Colors. In the same year he was knighted, and in 1872 he became an A.R.A., becoming R.A. in 1876. He died in 1897.

Gilbert, JOHN GIBBS, actor, born at Boston, Massachusetts, in 1810; died in 1897. After acting four years in the United States and England, he joined Wallack's company in New York in 1862. He was highly popular in old men characters, such as *Sir Peter Teazle, Sir Anthony Absolute, Old Dornton,* etc.

Gilbert, JOHN S., naval architect, was born in Connecticut in 1801; died in 1891. He invented the balance drydock now used at all im-

portant seaports, and built some of the largest drydocks in the United States. For several years he was in the service of the Austrian government, and declined tempting offers from Russia on account of age.

Gilbert, WILLIAM SCHWENK, an English dramatist, born in London in 1836. In 1857 he became a clerk in the Education Office, and in 1862 was called to the bar, but has devoted his time since then almost exclusively to literature. In 1875 he entered into partnership with Arthur Sullivan, the composer, and in conjunction with him produced a series of comic operas, *Trial by Jury* (1876), *Pinafore* (1878), *The Pirates of Penzance* (1880), *Patience* (1882), *Iolanthe* (1883), *Princess Ida* (1884), *The Mikado* (1885), etc. Died by drowning, May 29, 1911.

Gilbertine Order (gil'ber-tēn), an order of canons founded in England by Gilbert of Sempringham in the twelfth century. They followed the Augustinian rule, and their numerous monasteries were suppressed by Henry VIII. There was also a Gilbertine order of nuns.

Gilbert Islands, or KINGSMILL GROUP, a group of sixteen islands in the Pacific Ocean, on the equator, between lon. 172° 0′ and 174° 30′ E. Area about 170 sq. miles. They are of coral formation, and all low and not fertile. Their chief products are mostly the cocoanut, pandanus, taro, and the breadfruit tree. The islanders differ from the Polynesians, and more nearly resemble the Malays. The women are much smaller in proportion than the men, with delicate features and slight figures. Pop. of the group 40,000, of whom a certain number are Christians. They were annexed by the British government in 1892.

Gilberton, a borough in Schuylkill County, Pennsylvania, 4 miles from Mahanoy City; a mining town and the railroad center for all coal mined in the Mahanoy and Shenandoah Valleys. Pop. 5401.

Gilboa (gil-bō'a; Hebrew. 'Bubbling Fountain'), a range of hills in Palestine, bounding the plain of Esdraëlon on the N. E. One of them is identified with the ancient Gilboa, the scene of Saul's last fatal battle (I Sam., xxix. 1).

Gildas (gil'das) THE WISE (SAPIENS), a British ecclesiastic and historian of the sixth century, of whom little is known. There is extant a Latin treatise or diatribe ascribed to Gildas which bears the title of *Epistola de Excidio Britanniæ* ('On the Destruction of Britain'), but the violent invective which it employs against the Britons has led to doubts respecting its authenticity.

Gilder (gil'der), RICHARD WATSON, editor and author, born at Bordentown, New Jersey, in 1844. He engaged in railroad work, established the *Newark Register*, in 1870 became managing editor of *Scribner's Magazine*, and in 1881 editor-in-chief of *The Century*. He published *Five Books of Song*, *For the Country*, *In Palestine and Other Poems*, etc. He died in 1909.

Gilder, WILLIAM HENRY, Arctic explorer, brother of the preceding, was born at Philadelphia in 1838, died in 1900. He took part in the Franklin Search Expedition of 1878-80, and the De Long Arctic Expedition of 1881. After the disaster to the latter he made a winter journey of two thousand miles through Siberia to the nearest telegraph station, and took part in the search in the Lena delta for De Long and his companions. He wrote *Schwatka's Search* and *Ice Pack and Tundra*.

Gilding (gild'ing) is the art of applying gold-leaf or gold in a finely-divided state to surfaces of wood, stone, or metals, a very ancient art, it having been practiced among the Egyptians, Greeks, Romans, and ancient Persians. The processes employed at the present day are very varied. Metals are gilded either by what is called chemical gilding, mercurial gilding, electrogilding (see *Electrometallurgy*), or by the application of gold-leaf. Copper and brass, for instance, may be gilded by the process called *wash* or *water gilding*, with an amalgam of gold and mercury. The surface of the copper, freed from oxide, is covered with the amalgam, and afterwards exposed to heat till the mercury is driven off, leaving a thin coat of gold. Gilding is also performed by dipping a linen rag in a saturated solution of gold, and burning it to tinder, the black powder thus obtained being rubbed on the metal to be gilded, with a cork dipped in salt water, till the gilding appears. Iron or steel is often gilded by applying gold-leaf, after the surface has been well cleaned, and heated until it has acquired the blue color which at a certain temperature it assumes. Several leaves of gold are thus applied in succession, and the last is burnished down cold. One process of chemical gilding is by dipping the article into a solution of gold, what is termed Elkington's solution being composed as follows:—5 oz. (troy) of fine gold; nitrohydrochloric acid, 52 oz. (avoir-

dupois); dissolve by heat, and continue the heat until the cessation of red or yellow vapors; decant the clear liquid; add 4 gals. of distilled water, pure bicarbonate of potassium 20 lbs., and boil for two hours. Gilding on wood, plaster, leather, parchment, or paper is performed by different processes of mechanical gilding. The first of these is oil-gilding, in which gold-leaf is cemented to the work by means of oil-size. In the case of paper or vellum the parts to be gilt receive a coat of gum-water or fine size, and the gold-leaf is applied before the parts are dry. They are afterwards burnished with agate. Lettering and other gilding on bound books are applied without size. The gold-leaf is laid on the leather and imprinted with hot brass types. Brass rollers with thin edges are employed in the same way for lines, and similar tools for other ornaments. When the edges of the leaves of books are to be gilt they are first cut smooth in the press, after which a solution of isinglass in spirits is laid on, and the gold-leaf is applied when the edges are in a proper state of dryness. Japaner's gilding is another kind of mechanical gilding, which is performed in the same way as oil-gilding, except that instead of gold-leaf a gold dust or powder is employed. Frames of pictures and mirrors, moldings, etc., are gilt by the application of gold-leaf, or by the cheaper process of 'German gilding,' that is, by tin-foil or silver-leaf, with a yellow varnish above. Porcelain and other kinds of earthenware, as well as glass, may be gilt by fixing a layer of gold in a powdered state by the action of fire. The gold-dust or powder required in this operation may be obtained by precipitating it from a solution in aqua regia, either by means of sulphate of iron or protonitrate of mercury. In order that the gold powder may be applied to the surface of the article to be gilt it must be well mixed with some viscous vehicle, such as strongly-gummed water. It is then laid on with a fine camel-hair brush.

Gilead (gil'ē-ud), a mountain region on the east of Palestine, having Bashan on the north and Moab and Ammon on the south. It was noted for its balm, as well as for its pasturage.

Giles (jīlz), St. (*St. Ægidius*), a native of Greece, who, according to the legend, lived in the sixth century, and was descended from an illustrious family. He is said to have worked miracles, and founded a convent in France. He became patron saint of Edinburgh. His festival falls on the 1st of September.

Giles, St., name of a parish in London, with which is incorporated that of St. George, Bloomsbury, both in the borough of Finsbury. The wretchedness of St. Giles is often contrasted with the luxury of St. James in London.

Gilfillan (gil-fil'an), George, a British author, born in 1813; died in 1878. He became a licentiate of the Secession (Presbyterian) Church, and in 1836 was ordained to the School Wynd Church, Dundee. His numerous writings, among which may be mentioned *A Gallery of Literary Portraits*, and *The Bards of the Bible*, possess a vigorous style and great powers of fancy.

Gilfillan, Robert, a Scottish poet, born in Dunfermline in 1798; died in 1850. He learned to be a cooper, and after trying one or two other trades he was latterly collector of police rates in Leith. In 1831 he published a small volume entitled *Original Songs*.

Gilghit, or Gilgit (gil'git), a valley and district in Cashmere, situated on the southern slope of the Hindu Kūsh, and watered by the Gilgit, or Yasm, a tributary of the Indus.

Gill (jil), a measure of capacity equal to ¼ of a pint, and $\frac{1}{32}$ of a gallon.

Gill (gil), David, astronomer, born in Aberdeenshire in 1843. He became in 1879 royal astronomer at the Cape of Good Hope. He organized expeditions to observe two transits of Venus, and in 1885 began a photographic survey of the southern heavens, making a catalogue in 1895 of 450,000 stars. His publications have been valuable and numerous.

Gill, Theodore Nicholas, ichthyologist, born in New York in 1837. After many years' connection with the Smithsonian Institution, he became professor of zoology at Columbian University, now George Washington University, in 1884. He has published numerous papers on fishes and has given attention to other departments of zoology.

Gilles (zhēl), St., a town in Southern France, dep. Gard, a country rich in vineyards. Pop. 6381.

Gillette (gil'let), William Hooker, actor and dramatist, was born at Hartford, Connecticut, in 1857. He began a stage career in 1877, and after 1881 played in his own dramas. These include *The Professor*, *Held by the Enemy*, *Secret Service*, *Sherlock Holmes*, etc.

Gillies (gil'iz), John, a Scottish historian and scholar, born at Brechin in 1747; died at Clapham in

1836. He settled in London, where he applied himself to literature. He wrote a *History of Ancient Greece* and a *View of the Reign of Frederick II*, and translated a number of Greek works.

Gillray (gil-rä), JAMES, an English caricaturist, born about the middle of the eighteenth century; died in London in 1815. He caricatured the king (George III) and the members of the House of Lords and afterwards the French and the French celebrities of the day.

Gills (gils), the respiratory organs of animals which respire by obtaining oxygen from water, as crustaceans, molluscs, fishes and amphibians. In fishes they consist of cartilaginous or bony arches attached to the bones of the head, and furnished on the exterior convex side with a multitude of fleshy leaves or fringed vascular fibrils resembling plumes. The water is admitted by the gill-opening, and acts upon the blood as it circulates in the fibrils.

Gillyflower (jil'i-flou-ẽr), a name bestowed on such cruciferous flowers as the wallflower or carnation, etc. The clove-pink (*Dianthus Caryophyllus*) is termed clove gillyflower.

Gilman, CHARLOTTE PERKINS, an American author and lecturer, born at Hartford, Connecticut, July 3, 1860. Her books include *Women and Economics* (1898), *Concerning Children* (1900), *The Home, Its work and Influence* (1903), *The Man-Made World* (1910).

Gilman, DANIEL COIT, educator, born at Norwich, Connecticut, in 1831; died in 1908. He graduated at Yale in 1852, and was professor of geography there 1856-72; president of the University of California 1872-75. Elected the first president of Johns Hopkins University in 1875, he served there till 1901, and in 1902 was elected president of the Carnegie Institution. He was a member of the Venezuela boundary-line commission of 1896-97.

Gilmore, JAMES ROBERTS, author, born at Boston in 1832; died in 1903. He wrote, under the pen-name of Edmund Kirke, several novels of Southern life during the Civil war, and also wrote a number of historical works, including *The Rear-Guard of the Revolution*, *John Sevcir as a Commonwealth Builder*, etc.

Gilolo, JILOLO (jē-lō'lō), an island in the Indian Archipelago, the largest of the Moluccas; area, 6500 square miles. It is of singular form, consisting of four peninsulas, radiating N., N. E., E. S. E., and S., from a common center, and having large bays between. It is rugged and mountainous, the mountains being volcanic. The principal productions are sago, cocoanuts, spices, edible birds'-nests, useful timber, etc.; horses, cattle, and sheep abound. Deer, wild boars, and other game are likewise plentiful. The original inhabitants, called Alfoories, have been gradually pressed into the interior by the Malays. The island is under Dutch rule and has a population of about 120,000.

Gil Polo. See *Polo*.

Gilthead (gilt'hed; *Chrysophrys aurāta*), an acanthopterygious fish of the Sparidæ or sea-bream family common in the Mediterranean. It has strong grinding teeth for crushing the shells of the molluscs on which it feeds; a yellow band stretches from eye to eye (whence its generic name, signifying 'golden eyebrows'). Its color is a mixture of silver and sky-blue, its dorsal and caudal fins are black, while brown lines pass along the sides. It is a fine fish, and sometimes reaches a weight of 18 to 20 lbs.

Gilt Toys, the trade term for trinkets of copper or German-silver, with a thin coating of gold or silver spread over its surface. Gilt toys are thus cheaper than gold and silver jewelry, but they may be equally brilliant and as little liable to tarnish. In Britain this industry is chiefly carried on at Birmingham; and in France at Paris and Lyons.

Gimbals (gim'balz), the name of the pair of rings within which the mariner's compass is slung, or any pair of similar rings. The gimbals maintain the compass-bowl and the compass-card in a horizontal position, there being two concentric rings, the outer turning about a horizontal axis, and the inner turning about a similar axis at right angles to the other. Ship chronometers are often suspended the same way.

Gimlet (gim'let), a small tool with a pointed screw at the end, used for boring holes in wood or other substances by turning. A larger instrument of this nature is termed an *auger*.

Gimp (gimp), a silk, woolen, or cotton twist stiffened by a fine wire, or sometimes a coarse thread running through it, and much used in trimmings for dresses, etc.

Gin (jin), a spirit distilled from grain, and flavored with juniper-berries, and sometimes with oil of turpentine and common salt, and with other substances. The name is from *genièvre*, the French for 'juniper.' It is largely

manufactured in Holland, particularly in Schiedam, and the gin thence imported is thus often called Schiedam as well as Hollands. In Great Britain gin is largely manufactured in London, where it often goes by the name of *Old Tom*, and to a less extent at Plymouth and Bristol. What is termed 'gin' in Great Britain differs materially from Hollands and even from the best English gin, as it is a plain corn spirit, which derives its flavor from oil of turpentine, with certain aromatics in small quantities.

Gin, the name of certain machines employed in raising weights. One form consists of three poles, 12 to 15 feet long, often tapering from the lower extremity to the top and united at their upper extremities, whence a block and tackle is suspended. A space of 8 or 9 ft. separates the lower extremities planted in the ground, and a kind of windlass is attached to two of the legs. Another kind of gin is a sort of whim or windlass for raising coal, etc. It is worked by a horse, which turns a cylinder, and winds on it a rope, by which the weight is raised. See *Cotton Gin.*

Gingal (jin'gal), a kind of large musket used in some parts of Asia. It is fired from a rest, and may be mounted on a light carriage.

Gingelly Oil (jin-jel'i). See *Benné Oil.*

Ginger (jin'ger: *Zingiber officinale*), an East Indian plant of the order Zingiberaceæ. It grows in moist places in various parts of tropical Asia and the Asiatic islands, and has been introduced into the West Indies, particularly Jamaica, as also into S. America and W. Africa. The kind most esteemed is Jamaica ginger. The rhizome, or underground stem, is what is used, being employed in various ways. It has an aromatic, pungent taste, and when young is candied, and makes an excellent preserve. It is a favorite condiment and is used medicinally as a carminative, stomachic, and in indigestion. It enters into the composition of a great number of confections, infusions, pills, etc. The special preparations are the *tincture* and the *essence* of ginger, and the *syrup*, prepared by mixing twenty-five parts of syrup with one of the strong tincture. *Infusion* of ginger is a preparation useful for flatulence.

Ginger Plant (*Zingiber officinale*).

Ginger-ale, an aërated water made in the same way as lemonade, but flavored with ginger instead of lemon.

Ginger-beer, a pleasant, non-alcoholic, effervescing beverage, made by mixing together ginger, cream of tartar, sugar, yeast, and water, and allowing the whole to ferment for a time, then bottling. Ginger-beer may also be prepared thus: Add to each gallon of water 1 lb. of refined sugar, and ½ oz. of ground ginger. Boil for an hour, add the white of two eggs, remove the scum. Strain into a vessel to cool, cask it up with the juice and peel of a lemon. Add a very small amount of brewer's yeast, and bung up tightly for a fortnight.

Gingerbread, a well-known cake made in many ways, the chief ingredients being flour and treacle, with butter, eggs, etc., and enough ginger to flavor it.

Ginger-cordial, or GINGER-WINE, a beverage made from raisins, lemon rind, ginger, sugar, and water, with some whisky or brandy.

Gingham (ging'am), a cotton fabric distinguished from calico by having the colors woven with the fabric, not printed on it. The patterns are various; sometimes fancy designs, sometimes checkered, and sometimes striped. Umbrella ginghams are all of one color.

Gingko (ging'kō), the Japanese name of coniferous trees of the genus *Salisburia* belonging to the yew family. The *Salisburia adiantifolia* is a tree which sometimes rises nearly 100 feet in height. It is destitute of resin. It is a native of China and Japan, and was introduced into Europe in 1754, when it was brought to England. Its fruit encloses a kernel which, when roasted, may be used as food, and which tastes like maize.

Ginsburg (gins'bürh), CHRISTIAN, a rabbinical scholar, born at Warsaw in 1830. He is the author of *Historical and Critical Commentary on the Song of Songs; The Karaites, their History and Literature; The Essenes; The Kabbalah, its Doctrines, Development, and Literature,* and other works of similar character. His greatest work is, however, the *Massora.* He was one of the scholars engaged on the revised version of the Old Testament.

Ginseng (jin'seng), a plant of Northern Asia, *Panax schinseng*, order Araliaceæ, herbaceous,

and about 1 foot high. Its root is regarded as a sort of panacea among the Chinese, and is largely imported, but it appears to be really of very little efficacy; the taste is sweet and mucilaginous, accompanied with some bitterness, and also slightly aromatic. Another species of

American Ginseng (*Panax quinquefolium*).

ginseng, *Panax quinquefolium*, inhabits Canada and the northeastern parts of the United States. Quantities of its root are sent to China.

Gioberti (jō-bĕr'tē), VINCENZO, an Italian philosopher and statesman, born at Turin in 1801; died at Paris in 1852. Having been educated for the church, he was appointed chaplain to Charles Albert, King of Sardinia, but rendered himself obnoxious by his republican sentiments, and was first imprisoned, and, in 1833, banished. The first few years of his exile he spent at Paris, and afterwards became a teacher of philosophy in a school at Brussels. There he published two works, one of which was an attempt to reconcile philosophy and Roman Catholicism. In 1843 appeared his *Primato Morale e Civile degli Italiani*, a defence on liberal principles of the papacy, a work which brought over the majority of the priests to the national party. In 1847 he published a work entitled *Il Gesuita Moderno* ('The Modern Jesuit'). When Charles Albert in 1848 granted a constitution to Sardinia, Gioberti returned to his native country, but he soon after withdrew to Paris.

Giobertine Tincture (jō-bĕr'tin), a preparation for restoring illegible writings or faded pictures. The inventor of it was Giovanni Antonio Gioberti (1761-1824), a native of Piedmont.

Gioja Del Colle (jō'yȧ del kol'lā), a town in Southern Italy, province of Bari, on a slope of the Apennines. Pop. 21,721.

Giordano (jor-dā'nō), LUCA, an Italian painter, born at Naples about 1632, a scholar of Spagnoletto, studied the great Italian masters at Rome, and became the pupil of Peter of Cortona. Paul Veronese had afterwards great influence on his manner. He imitated the greatest masters so well that even connoisseurs were imposed upon. In 1679 he was employed by Charles II to ornament the Escurial, and at the court of Spain he became a great favorite. Giordano was especially successful in imitating the manner of Bassano, and of the Chevalier Massimo Stanzioni. After the death of Charles II he returned to his native country, where he died about 1705. His most celebrated pieces are his frescoes, in the Escurial, at Madrid, Florence, and Rome. Some of his finest paintings are at Dresden.

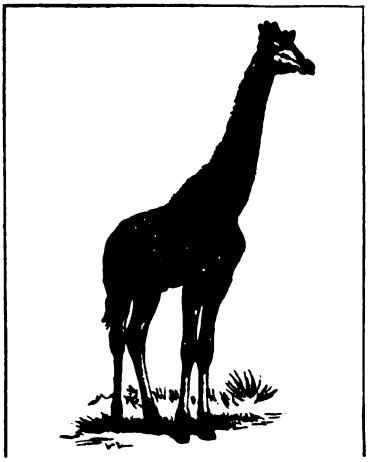
Giorgione (jor-jō'nā), properly GIORGIO BARBARELLI, born in 1477 at Castelfranco, one of the most celebrated painters of the Venetian school. In Venice he ornamented the façades of several large buildings with frescoes, which have mostly perished. He found in Titian a formidable rival in this branch of his art. His portraits are reckoned among the finest of the Italian school. His pieces are rare, but some are to be seen at Milan, and in the galleries at Vienna and Dresden. He died in 1511.

Giotto (jot'tō), properly AMBROGIOTTO or ANGIOLOTTO BONDONE, a celebrated Italian painter. He was born probably about 1276, at the Florentine village of Vespignano, and in his boyhood tended cattle. But having been seen by Cimabue, as he was drawing figures of his sheep upon a piece of slate, that artist carried him to Florence and taught him painting. His natural talent and gracefulness developed so rapidly that he soon surpassed all his contemporaries. He represented human figures with truth and nature, and surpassed all others in the dignity and pleasing arrangement of his figures, and a regard to the proportions and disposition of the drapery. His figures have more life and freedom than those of Cimabue, as he particularly avoided the stiff style. Among his most celebrated pieces is the *Navicella* (ship), at Rome (a picture of 'Peter Walking Upon the Waves'), some fresco paintings at Florence, also the history of St. Francis, at Assisi, and several miniatures. He was equally successful as a statuary and as an architect. He died in 1336.

Giovinazzo (jō-vē-nät'sō), a seaport of South Italy, province of Bari, on the Adriatic, the seat of a bishop. Pop. 11,617.

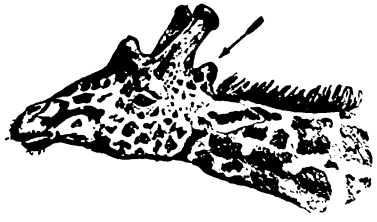
Gipsy. See *Gypsies*.

Giraffe (ji-raf'; *Camelopardălis giraffa*), a ruminant animal inhabiting Africa, and constituting the only species of its genus and family. It is the tallest of all animals, a full-grown male reaching the height of 18 or 20 feet.



Giraffe (*Camelopardalis giraffa*)

This great stature is mainly due to the extraordinary length of the neck, in which, however, there are but seven vertebræ, though these are extremely elongated. It has two bony excrescences on its head resembling horns. Its great height is admirably suited with its habit of feeding on the leaves of trees, and in this the animal is further aided by its tongue, which is both prehensile and capable of being remarkably elongated or



Five-Horned Giraffe, showing Missen Horns.

contracted at will. When it browses the herbage on the ground it stretches out its forelegs as wide as possible till it can reach the ground by means of its long neck. Its color is usually light fawn, marked with darker spots. It is a mild and inoffensive animal, and in captivity is very gentle and playful. The giraffe is a native of a great part of Africa, from Abyssinia and Sennar to Senegal and the regions adjacent to the Cape Colony.

Giraldus Cambrensis (je-ral'dus kam-bren'sēs), an early English historian, born about 1146. His proper name was Gerald de Barry, and he was son of William de Barry, a Norman noble of Pembrokeshire. He was educated under his uncle, the Bishop of St. David's, and afterwards at the University of Paris. He returned in 1172, and was appointed archdeacon of St. David's. His uncle dying soon after, Gerald was elected to succeed him, but the king refused to confirm the appointment, and Gerald withdrew to Paris, where he was appointed professor of canon law. In the following year (1180) he returned to England, where he was required to administer the bishopric of St. David's, the proper bishop having proved himself incompetent. He discharged this office for four years, and was then appointed a royal chaplain. As companion to the king's son, Prince John, he went to Ireland in 1185, where he collected the materials for his Topography of Ireland (*Topographia Hiberniæ*). He afterwards drew up a similar work on Wales (*Itinerarium Cambriæ*). When he died is uncertain.

Girard (ji-rard'), STEPHEN, plutocrat and philanthropist, was born near Bordeaux, France, in 1750. In 1769 he established himself in business in Philadelphia, and in 1782 laid the foundation of a great fortune in the West India trade. In the war of 1812 he was the financial mainstay of the United States government, at one time advancing $5,000,000. At his death, in 1831, his property amounted to $9,000,000, a sum considered very large at that time, and the bulk of which was left for charitable purposes. The celebrated Girard College, at Philadelphia, was founded by him, costing $2,000,000, an institution for the education of orphan boys, between the ages of six and fourteen. It has proved one of the most successful and useful of charitable institutions.

Girardin (zhē-rär-daṇ), EMILE DE, a French journalist and politician, born in Switzerland in 1802, and educated in Paris. He was connected as projector, editor, or otherwise with a number of newspapers and periodicals, the most successful being *La Presse*, a Conservative organ established in 1836. A controversy in its columns led to a duel between Girardin and Armand Carrel,

which proved fatal to the latter. In politics Girardin played many parts. He was fined 5000 francs in 1867 for attacks on the imperial government in *La Liberté*. He wrote numerous political pamphlets, and a few pieces for the stage. He died in 1881.—His first wife, Delphine Gay, daughter of the novelist Madame Sophie Gay, was a well-known authoress; born 1804; died 1855. She wrote the novels *Le Lorgnon*, *Le Marquis de Pontanges*, *La Canne de M. de Balzac*, *Il ne faut pas jouer avec Douleur*, and *Marguerite;* contributed to the *Presse* newspaper, and wrote for the stage *Lady Tartuffe* and *La Joie fait peur*, and other pieces.

Girasol (ji'ra-sōl), a precious opaline stone, which, under strong lights, reflects a brilliant reddish light. It is usually of a milk-white or bluish-white color. The brightest are brought from Brazil and Siberia. The name is sometimes bestowed on the Asteria sapphire. One variety is known as the fine opal.

Girder (gir'dẽr), a main beam, either of wood or iron, resting upon a wall or pier at each end, employed for supporting a superstructure, or a superincumbent weight, as a floor, the upper wall of a house when the lower part is sustained by pillars, the roadway of a bridge, and the like. Wooden girders are sometimes cut in two longitudinally and an iron plate inserted between the pieces, and the whole bolted together. This species of girder is called a *sandwich-girder*. For bridges cast-iron girders are sometimes cast in lengths of 40 feet and upwards, but when the span to be crossed is much greater than 40 feet, recourse is had to wrought-iron, or to *trussed, lattice*, or *box girders*, and cast-iron is now little used. A *trussed-girder* is a wooden girder strengthened with iron. A *lattice-girder* is a girder consisting of two horizontal beams united by diagonal crossing bars, somewhat resembling wooden latticework. A *box-girder* is a kind of girder resembling a large box, such as those employed in tubular bridges. There are also *bowstring-girders*, which are varieties of the lattice-girder, and consist of an arched beam, a horizontal tie resisting tension and holding together the ends of the arched rib, a series of vertical suspending bars by which the platform is hung from the arched rib, and a series of diagonal braces between the suspending bars.

Girdle of Venus (*Cestum Veneris*), an animal belonging to the actinozoa, found in the Mediterranean. In shape it resembles a ribbon, and it is apparently propelled by the cilia which fringe its edge. The mouth is situated on the inferior edge. It is iridescent at night.

Girgeh (jir'je), a town, formerly capital, of Upper Egypt, on the left bank of the Nile. It possesses a Roman Catholic convent, the oldest in Egypt. Pop. 19,893.

Girgenti (jir-jen'tē), a town in the southwest of Sicily, capital of the province of same name, 58 miles S. S. E. of Palermo, a few miles from the sea, on an elevated site, with a cathedral, library, museum, etc. It exports wheat, oil, fruit, and sulphur, its port being Porto Empedocle. Near the town are the extensive and remarkable ruins of the ancient Agrigentum. Pop. 25,024.—The province has an area of 1490 square miles, and is rather mountainous in character. Pop. 371,638.

Girodet-Trioson (zhē-ro-dā-trē-o-sōn), ANNE LOUIS GIRODET DE ROUSSY, a French historical painter, born in 1767; died in 1824. Among his famous pictures are *Endymion*, *Hippocrates*, *The Deluge*, *Atala*, *Napoleon Receiving the Keys of Vienna*, and *St. Louis in Egypt*.

Gironde (zhē-rōnd), a department of France, on the Bay of Biscay, named from the Gironde estuary; area, 3160 square miles. The surface is generally flat, and almost the whole department belongs to the basin of the Gironde, which is formed by the junction of the Dordogne and Garonne. The climate is generally mild and extremely moist. One-third of the surface is waste, and about one-fourth is arable land. The staple production is wine, Médoc, Graves, Côtes, and Entre-deux-Mers being the most celebrated growths. (See *Bordelais Wines.*) The forests of oak and pine are extensive. The minerals are unimportant, but much salt is obtained from lagoons. The manufactures are varied: the trade, which has its center at Bordeaux, is very important. Bordeaux is the capital. Pop. (1906) 823,925.

Gironde, RIVER. See *Garonne.*

Girondists (zhē-rōnd-ists), GIRONDINS, one of the great political parties of the first French revolution. The Girondists were republicans, but were more distinguished for visionary ideals than for a well-defined policy; hence they fell an easy prey to the party of the Mountain. Their leaders were three of the deputies of the Gironde—Verginaud, Guadet, and Gensonné, hence the name. Louis XVI was obliged, in 1792, to select a ministry from among

the Girondists, but it was short-lived. In the convention their struggles with the Montagnards forced them into extreme measures which they would otherwise have avoided. They wished to save the king, but many of them, from a mistaken policy, voted for his death. Their fall dates from their unsuccessful impeachment of Marat (1793), soon after which a large number of them were proscribed, and twenty-one executed.

Girton College, Cambridge, the most noted college for women in England. Opened in 1869 at Hitchin, it was removed to Girton, and opened in 1873. Newnham Hall, Cambridge (opened 1875), is also connected with it.

Girvan (gir'van), a seaport of Scotland, county of Ayr, situated at the head of a fine bay, on the Girvan. The winter herring fishery is the most important industry. Pop. 4024.

Gisors (zhē-sōr), a town of Northern France, department of Eure, with a well-preserved castle of the twelfth century. Pop. (1906) 4345.

Gissing (gis'ing), GEORGE ROBERT, novelist, born at Wakefield, England, in 1857; died in 1904. He made a close and accurate study of the London populace, and wrote a large number of novels, somber but strong life-pictures.

Gitschin (gich'in), a walled town of Northeastern Bohemia, in a fine valley, on the Cidlina. It has a castle built by Wallenstein, whose residence it was. Pop. 10,000.

Giulio Romano (jō'lē-ō rō-mä'nō), or GIULIO PIPPI, an Italian painter, architect, and engineer, the most distinguished of Raphael's scholars, born at Rome near the end of the fifteenth century. During the lifetime of Raphael he painted with him and under his direction, and many of his productions are quite in his manner. After having finished the fresco-work in the Hall of Constantine in the Vatican at Rome, under Clement VII, he went to Mantua, where he executed a series of remarkable works in architecture, painting, and engineering. The Palazzo del T (palace of the T) was rebuilt and ornamented entirely by him, or under his direction. After the death of San Gallo in 1546 the building of St. Peter's was committed to him, but he died the same year. After the death of Raphael he gave himself up to his own imagination, and astonished all by the boldness of his style, by the grandeur of his designs, by the fire of his composition, by the loftiness of his poetical ideas, and his power of expression.

Giurgevo (jur-jā'vō), a town in Roumania, on the Danube, opposite Rustchuk, the most important shipping port on the Roumanian side of the river. The Russians were defeated here by the Turks in 1854. Pop. 13,978.

Giusti (jus'tē), GIUSEPPE, an Italian satirical and political poet, born in 1809; died in 1850. He is considered by his countrymen as the rival of Béranger in popular lyrical poetry.

Givet (zhē-vā), a town of Northeastern France, in the Ardennes, with leather manufactories and other industries. It is a place of great strategic importance, and its citadel of Charlemont is of great strength. Pop. (1906) 5110.

Givors (zhē-vōr), a town of Southeastern France, department of the Rhône, and on that river, a center of the coal trade, with ironworks, glassworks, silk weaving and dyeing-works, etc. Pop. (1906) 11,444.

Gizeh (gē'ze), a town of Egypt, on the left bank of the Nile, opposite Old Cairo. Some miles off are the celebrated pyramids, which have been named from it. Pop. 11,500.

Gizzard (giz'ard), a strong muscular part of the alimentary canal of birds, which enables them to grind their food. A gizzard occurs also in many gasteropods, and in certain cephalopods and crustaceans. In birds it is lined by a thick muscular coat, and usually contains pieces of gravel, etc., to facilitate the grinding process.

Glace Bay, a port of Cape Breton, Nova Scotia, 15 miles from Sydney. Has large coal mines. Pop. 16,561.

Glacial Period (glā'shal), or ICE AGE, in geology denotes that portion of the post-tertiary period, in which Europe and North America, north of latitude 50°—40° were subjected to intense cold, and covered with ice and glaciers to a great depth. This phenomenon has been demonstrated from a study of the actual effects of glaciers in the Alps, and of varied traces of surface change and disturbance that could have had no other origin. The traces of ancient glacial action are abundantly discoverable in Britain and Scandinavia and in other parts of Northern Europe, and are profuse across nearly the whole width of North America. They are found also in the Himalayas and some other regions. See *Geology*.

Glacier (glā'sher) NATIONAL PARK. The government of the United States has for years been acquiring localities of great natural attraction, or remarkable for unique features, to be

kept permanently unchanged as public areas. Prominent among these are the Yellowstone and the Yosemite National Parks. An important addition to this series of national areas is the Glacier National Park, set aside by acts of Congress in 1910. This lies in Northern Montana, between the Canadian border and the line of the Great Northern Railroad. It contains about a million acres, being second in area only to Yellowstone Park. The region is one of natural wonders, which range from verdant valleys and wooded heights to glacial peaks. Within the area are numerous glaciers and mountain lakes, the locality presenting many examples of sublime scenery. Birds and animals are numerous, and the locality as a whole forms a splendid addition to our series of national pleasure grounds.

Glaciers (glā'shers), icy masses of great bulk, harder than snow, yet not exactly like common ice, which cover the summits and sides of mountains above the snow-line. They are found in Switzerland, Scandinavia, the Andes, the mountains of Alaska, in

Glacier of Zermatt, Switzerland.

many parts of the Rocky Mountain range, etc. They extend down into the valleys often far below the snow-line, and bear a considerable resemblance to a frozen torrent. They take their origin in the higher valleys, where they are formed by the congelation and compression of masses of snow in that condition called by French writers *névé*, by German authors *firn*. The ice of glaciers differs from that produced by the freezing of still water, and is composed of thin layers filled with air-bubbles. It is likewise more brittle and less transparent. The glaciers are continually moving downwards, and not infrequently reach the borders of cultivation. The rate at which a glacier moves generally varies from 18 to 24 inches in twenty-four hours. At its lower end it is generally very steep and inaccessible. In its middle course it resembles a frozen stream with an undulating surface, broken up by fissures or *crevasses*. As it descends it experiences a gradual diminution from the action of the sun and rain, and from the heat of the earth. Hence a phenomenon universally attendant on glaciers—the issue of a stream of ice-cold turbid water from their lower extremity. The descent of glaciers is shown by changes in the position of masses of rock at their sides and on their surface. A remarkable glacier phenomenon is that of *moraines*, as they are called, consisting of accumulations of stones and detritus piled up on the sides of the glacier, or scattered along the surface. They are composed of fragments of rock detached by the action of frost and other causes. The fissures or crevasses by which glaciers are traversed are sometimes more than 100 feet in depth, and from being often covered with snow are exceedingly dangerous to travelers. One of the most famous glaciers of the Alps is the Mer de Glace, belonging to Mont Blanc, in the valley of Chamouni, about 5700 feet above the level of the sea. It is more especially, however, in the chain of Monte Rosa that the phenomena of glaciers are exhibited in their greatest sublimity, as also in their most interesting phases from a scientific point of view. Glaciers exist in all zones in which mountains rise above the snow-line. Those of Norway are well known, and they abound in Iceland and Spitzbergen. Hooker and other travelers have given accounts of those of the Himalaya. They are conspicuous on the Andes, while the Southern Alps of New Zealand rival in this respect the Alpine regions of Switzerland.

The problem of the descent of the glaciers is of extraordinary interest, and various theories have been put forward to account for it. It was shown by Professor J. D. Forbes, of Edinburgh, that a glacier moves very much like a river; the middle and upper parts faster than the sides and the bottom; and he showed that glacier motion was analogous to the way in which a mass of thick mortar or a quantity of pitch flows down in an inclined trough. His theory is known as the *viscous theory* of glaciers, which presupposes that ice is a plastic body, and this plasticity has been satisfactorily explained by Professor James Thomson, of Glasgow, by the phenomenon of the melting and refreezing of ice. Water, he dis-

covered, when subjected to pressure, freezes at a lower temperature than when the pressure is removed. Consequently, when ice is subjected to pressure it melts; if it is relieved of pressure the water again solidifies. Therefore if two pieces of ice are pressed together, they tend to relieve themselves by melting at their points of contact, and the water thus produced immediately solidifies on its escape. If ice is strained in any way it similarly relieves itself at the strained parts, and a similar regelation follows. This, when applied to the glaciers, gives a complete explanation of their plasticity. Pressed downwards by the vast superincumbent mass, the ice gradually yields. Melting and refreezing takes place at at strained points goes on. In the latter some parts, at others the gradual yielding process there is no visible melting, but there is the gradual yielding from point to point to the pressure above, and there is the transference relatively to each other of the molecules that constitute the, at first sight, solid mass. If, however, at certain points the strain is intense, the ice becomes extremely brittle. The latter fact disposes of Tyndall's objection to Forbes's theory, which was based on the fact that *crevasses* proved the brittleness, and not the viscosity of ice.

Glacier Tables, large stones found on glaciers supported on pedestals of ice. The stones attain this peculiar position by the melting away of the ice around them, and the depression of its general surface by the action of the sun and rain. The block, like an umbrella, protects the ice below it from both; and accordingly its elevation measures the level of the glacier at a former period. By and by the stone table becomes too heavy for the column of ice on which it rests, or its equilibrium becomes unstable, whereupon it topples over, and falling on the surface of the glacier covers a new space of ice, and begins to project afresh.

Glacis (glā'sis), in fortification, is the sloping surface of the outermost portion of a fortified line, descending from the parapet of the covered way to the level ground or open country in front. It must be so placed that the guns of the fort will rake it at every point.

Gladbach, Bergisch- (berg'ish-glät'-bäh), a manufacturing town of Prussia, province of Rheinland, 8 miles northeast of Cologne. Pop. (1905) 13,410.

Gladbach, Mönchen- (meun'hen-glät'bäh), a town of Prussia, province of Rheinland, 16 miles west of Düsseldorf, with extensive manufactures of cotton and mixed cotton goods, etc. Pop. (1905) 60,714.

Gladden, Washington, author, born at Pottsgrove, Pennsylvania, in 1836; was ordained in the Congregational Church, and became a pastor in Columbus, Ohio, in 1882. He has written very largely on social reforms and other subjects, among his books being *Tools and the Man, Social Salvation, Christianity and Socialism, The Church and Modern Life,* etc.

Gladiators (glad-i-ā'turs), combatants who fought at the public games in Rome for the entertainment of the spectators. The first instance known of gladiators being exhibited was in B.C. 264, by Marcus and Decimus Brutus at the funeral of their father. They were at first prisoners, slaves, or condemned criminals; but afterwards freemen fought in the arena, either for hire or from choice; and later men of senatorial rank, and even women, fought. The regular gladiators were instructed in schools (*ludi*), and the overseer (*lanista*) purchased the gladiators and maintained them. Men of position sometimes kept gladiatorial schools and lanistæ of their own. The gladiators fought in the schools with wooden swords. In the public exhibitions, if a vanquished gladiator was not killed in the combat, his fate was decided by the people. If they wished his death, perhaps because he had not shown sufficient skill or bravery, it is stated that they held up their thumbs; the opposite motion was the signal to save him. This, however, is doubtful, the meaning of the terms used to express it being uncertain. According to some authors, the significance of the thumb movement was the reverse of that above stated. The victor received a branch of palm or a garland. The gladiators were classified according to their arms and mode of fighting; thus there were *retiarii* who carried a trident and a net (L. *rete*) in which they tried to entangle their opponent; *Thracians,* who were armed with the round Thracian buckler and a short sword; *secutores,* who were pitted against the *retiarii,* etc.

Gladiolus (gla-dī'ō-lus), a genus of plants of the iris order, having a bulbous root with a recticulated covering, natives of Europe and N. Africa, but especially S. Africa. The leaves are ensiform, the flowers brilliantly colored. There are many species, some of them popular garden plants, others grown in hothouses.

Gladstone (glad'stun), Herbert John, son of the fa-

mous statesman, William E. Gladstone, was born at London in 1854. He was educated at Eton and Oxford and entered parliament in 1880, being private secretary to his father, then prime minister, in 1880-81, and subsequently holding various positions in the treasury, the war, and the home offices, being first commissioner of works 1894-95, and subsequently secretary of state for home affairs. In 1909 he was appointed governor-general of the newly organized commonwealth entitled the Union of South Africa.

Gladstone, William Ewart, a celebrated statesman, son of Sir John Gladstone, was born at Liverpool in 1809. He entered Eton 1821, and left it in 1827, becoming afterward a student of Christ Church, Oxford. He left college in 1831, having taken high honors. After leaving Oxford he spent six months in Italy. In 1832 the first Reform Act was passed, and Mr. Gladstone's public career commenced by his being returned for Newark, and in 1834

Right Hon. W. E. Gladstone.

accepting the post of Junior Lord of the Treasury in Peel's cabinet. At this period he was a Tory, and as his party quickly went out it was not until 1841 that he again held any public office, in which year he became, under Peel, Vice President of the Board of Trade and Master of the Mint. In 1842 great fiscal reforms were inaugurated, some of which were understood to be due to Mr. Gladstone. Having become President of the Board of Trade, he carried, in 1843, a measure for the abolition of restrictions on the exportation of machinery, and in 1844 he carried a railway bill, establishing cheap trains. He took part with Peel in the repeal of the corn-laws, a course which cost him his seat for Newark. In 1847 he was returned for Oxford University, and he then supported the bill for the removal of Jewish disabilities, the repeal of the Navigation Laws, etc. He now began to develop remarkable ability as a financier, and fiercely attacked Mr. Disraeli's budget of 1852. The same year he became Chancellor of the Exchequer under the Earl of Aberdeen, a post which he also held for a short time in 1855 under Lord Palmerston. In 1858 he became High Commissioner Extraordinary to the Ionian Islands, and his *Studies on Homer* appeared about the same time. In 1859 he again took office as Chancellor of the Exchequer under Lord Palmerston. At the general election of 1865 Mr. Gladstone was returned for South Lancashire, and on the decease of Lord Palmerston he became the Liberal leader in the Commons in the Russell administration, still continuing to hold the Chancellorship of the Exchequer. The government, being defeated on the reform question, went out in 1866, and Lord Derby came into power. In 1867 a Reform Bill, establishing household suffrage in burgs, was carried by the Conservatives, but to the final shape of it Mr. Gladstone and Mr. Bright materially contributed. In 1868 Mr. Gladstone succeeded in abolishing compulsory church rates, and he also carried his resolutions dealing with the Irish Church, but his Irish Church Suspensory Bill was rejected by the Lords. At the general election of 1868 he lost his seat for South Lancashire, but was returned by Greenwich. There being a great Liberal majority in the new parliament, Mr. Disraeli was soon forced to resign, and Mr. Gladstone became premier. Next year he carried his bill for the disestablishment of the Irish Church, and in 1870 his Irish Land Act. In 1871 army purchase was abolished. The Ballot Act was passed in 1872, the *Alabama* claims were settled, and the Scottish Education Act enrolled on the statute-book. Parliament was dissolved in 1874, and the Conservatives ousted Mr. Gladstone from office, as they had secured a good majority. During Lord Beaconsfield's tenure of office Mr. Gladstone denounced the Bulgarian atrocities, the Anglo-Turkish Treaty, and the Afghan War, and his speeches during his candidature for Midlothian greatly helped to render the government unpopular. In 1880 the general election reinstated Mr. Gladstone firmly into power (Midlothian being now his constituency), and his second Irish Land Bill became law in the following year. In 1882 a

Prevention of Crimes and an Arrears Act for Ireland were passed, and in 1883 measures relating to bankruptcy, etc., were also carried. In 1884 the bill extending household suffrage to the counties was carried, and the Gladstone ministry fell the next year. Lord Salisbury, who had formed an administration, got the Redistribution of Seats Bill passed, and under it took place the general election of 1885, Mr. Gladstone still continuing to represent Midlothian. Next year Lord Salisbury resigned after an adverse vote in the Commons, and Mr. Gladstone again came into power. He soon startled the country by introducing a measure of Home Rule for Ireland. It failed to pass the Commons, and an appeal was made to the country, the result of which was emphatically adverse to Mr. Gladstone's proposals. He had to make way for Lord Salisbury. In 1892 the result was again reversed; Gladstone once more resumed authority; he resigned March 2, 1894, and died May 19, 1898, being interred with a State funeral at Westminster Abbey.

Glagolitic Alphabet (g l a g-o-lit'-ik), an ancient Slavonic alphabet. The Slavonic languages have from very ancient times been written with two alphabets, the glagolitic and cyrillic. The latter is the modern Slavonic and Russian alphabet; the former is still used in Istria, Croatia, and Dalmatia, and its use has been authorized in the Roman Catholic liturgies of those districts.

Glair (glār), the white of eggs, used as a varnish for preserving paintings. Bookbinders also use it for finishing the backs of books.

Glaisher (glā'sher), an English aeronaut and meteorologist, born in 1800, died in 1903. His balloon ascent of 37,000 ft. is the highest on record.

Glamorgan (gla-mor'gan), or GLAMORGANSHIRE, a county in South Wales; area, 576,540 acres. The north and northeast parts of the county are extremely mountainous, and often exhibit scenes of the most romantic beauty. The southern portion is comparatively level and very fertile, particularly the Vale of Glamorgan. The climate in this part is remarkably mild, as snow does not lie long on the ground, and tender shrubs thrive in the open air. Glamorganshire belongs wholly to the basin of the Severn; and all its streams, of which the Taff is the largest, flow in a south direction. The cattle are reckoned among the best in Wales. The mineral wealth of Glamorganshire is of incalculable value. Its coal-fields, its stores of ironstone and limestone, are most extensive, and the ironworks of Dowlais and Cyfarthfa are among the largest in the world. The woolen manufacture is carried on to some extent. Principal towns—Cardiff, the capital; Merthyr-Tydfil, Swansea, and Neath. The county returns five members to the House of Commons. Pop. 1,130,818.

Glance (glans), a name given to some minerals which possess a metallic or pseudometallic luster; as *antimony glance, bismuth glance, cobalt glance*, etc.

Glance-coal. See *Anthracite.*

Glanders (g l a n' d e r s), one of the most formidable diseases to which horses are subject, indicated by a discharge of purulent matter from the points of contagion, sometimes one or both nostrils, with a hard enlargement of the submaxillary glands. In acute glanders the discharge, by its copiousness, impedes respiration and ultimately produces suffocation. The disease is highly infectious, and may easily be communicated to man by the purulent matter coming in contact with the skin or mucous membrane. The disease is treated by mallein. See also the article *Farcy.*

Glands, a certain class of structures in animals, some of them forming organs which are the seat of an excretion, and provided with an excretory canal. In man there are two lachrymal glands, situated at the external angle of the eyes under the upper eyelid; six salivary, of which three are on each side, behind and under the lower jaws; two parotid, two submaxillary, two sublingual, two mammary, confined to the female (the breasts in women); the liver, the pancreas, the two kidneys, etc. The lymphatic glands, which take up and elaborate the lymph, are somewhat different from these in character; and still more different are certain other bodies denominated the ductless glands, as the spleen, thymus, pineal, thyroid, pituitary, and suprarenal (or adrenal). Botanists have given the name of glands to small bodies observed upon the surfaces of plants, and many of which seem to secrete certain fluids.

Glanvil, or GLANVILLE (glan'vil), RANULPH DE, English lawyer and warrior of the 12th century. In the reign of Henry II he held the office of justiciary, and repelled the invasion of William the Lion, King of Scotland, who was taken prisoner as he was besieging the Castle of Alnwick. Richard I is said to have imprisoned Glanvil,

and obliged him to purchase his freedom with £15,000 towards a crusade to the Holy Land. He accompanied his master on this expedition, and perished at the siege of Acre in 1190. To Glanvil is attributed a treatise on the laws and customs of England (*De Legibus et Consuetudinibus Angliæ*), written about 1181, and first printed in the year 1554, being the earliest treatise on English law.

Glarus (glä'rös), a Swiss canton, surrounded by St. Gall, the Grisons, Uri, and Schwyz, area 266 sq. miles. On all sides, except towards the north, Glarus is walled in by lofty mountains; lakes are numerous, and the scenery in their neighborhood is magnificent. The inhabitants are chiefly engaged in the cotton manufacture and in agricultural pursuits, rearing sheep and cattle, and exporting cheese, butter, etc. The constitution is a pure democracy. Pop. 33,349. The capital, Glarus, situated on the Linth amid grand scenery, is a well-built town, with a good trade. Pop. 6000.

Glasgow (glas'kō or gō), the largest city in Scotland, and the second in size in Great Britain, is situated mainly in the county of Lanark (a small portion being in Renfrew), on both banks of the Clyde, the larger and more important part of it on the right or north bank. The southern portion is built on low-lying level ground, the northern portion to a great extent on a series of elevations of varying heights. The streets are in general wide and straight, running mostly at right angles east and west, and north and south. Of the former may be mentioned as a great thoroughfare the Trongate and its continuation Argyle Street, of the latter Buchanan Street. The houses are built almost wholly of freestone, and as a whole Glasgow is now excelled by few cities in the kingdom in architectural beauty. Of the buildings the cathedral, situated in the northeast of the city, is the only one of historical interest. It is supposed to have been begun about 1240, and completed within the next two centuries. It is a large Gothic edifice in the early Pointed style, with tower and spire from the center; length of interior 319 feet; width 63 feet; height of nave 90 feet, of choir 85 feet, spire 225 feet. It is especially distinguished for the beauty of its crypt, one of the most perfect in Britain. The windows are filled with painted glass on a uniform plan. The University of Glasgow was founded in 1451, and is now a flourishing institution. Connected with it is the Hunterian Museum of anatomy, natural history, etc., left by Dr. William Hunter. The Municipal Buildings, in the center of the city, in George Square, form an imposing pile in the Renaissance style. They were completed in 1887. Most of the public monuments are collected in George Square, the finest square in the city. Glasgow has several public parks, the largest, the Green, containing 140 acres. There are also Botanic Gardens with extensive hothouses. There is a collection of pictures belonging to the city, and containing a number of very valuable works especially of the Venetian school. The industries are unequaled for variety by any town in the kingdom, with the exception, perhaps, of London. They embrace cotton, linen, woolen, silk, and jute, in all the processes of manufacture; calico-printing, dyeing, and bleaching; pig and malleable iron and steel, and machinery and metal goods of all descriptions; shipbuilding, which might almost be called a staple, over 400,000 tons of shipping having been launched in some years on the Clyde; extensive chemical works, potteries, glassworks, brickworks, breweries, distilleries, tanneries, tobacco-works, sugar-refining works, etc. The commerce is commensurate in extent with the manufactures. The river itself, the chief highway of this commerce, has been navigable for large vessels up to the heart of the city, and the harbor accommodation has been and is still being extended by the construction of docks, quays (of which there are over 6 miles), and other improvements. In the extent of its merchant marine Glasgow is surpassed by few cities in the world. The improvement of the navigation of the Clyde, which within the past century was fordable at and below the present harbor of Glasgow, has been of immense service to the city, though the total cost of deepening, widening, straightening, and the construction of quays, docks, etc., has exceeded $100,000,000. The railways and the Forth and Clyde and Monkland Canals form important auxiliary means of communication. Horse tramways pass along the principal streets, and are under municipal control. In a sanitary point of view Glasgow has greatly improved in recent times, but it still remains less healthy than it might be. During recent years the whole municipal expenses have been defrayed without any direct taxation; the profits made by the city in street-cleaning, gas, water, tramways, etc., leaving a margin over all costs of government. The city is well supplied with water from Loch Katrine.

Glasgow is a very ancient city. Its origin may be traced back to the foundation of the bishopric by St. Mungo,

about 560. It was erected into a royal burgh in 1180. The first bridge was built in 1345. Its industrial importance did not begin until after the union in 1707, its previous trade being chiefly with Europe. The Union opened up the trade with the American colonies, and tobacco became a source of wealth to the Glasgow merchants. Commerce then began to take other directions, and the progress made within the nineteenth century was remarkable. Pop. in 1610, 7644; 1712, 13,832; 1801, 77,385; 1901, 761,109. In addition there are large suburbs, and the city of Paisley is situated on the outskirts.